Storage Center 5.5

System Manager

User Guide

Storage Center System Manager 5.5 User Guide

680-019-009

Revision	Date	Description
A	03/16/11	Initial release for Storage Center 5.5.2
B	4/12/11	Updated to include new locations for contacting Dell technical support and downloading product manuals and other editorial changes and corrections.

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Contents

Preface

Purpose vii
Related Publications vii
Contacting Dell Support Services vii

1 Introduction

What's New in this Release 2
Introducing the Storage Center System Manager 7
Navigation 12

2 Quick Start Guide

Introduction 16

3 Servers

Introduction 28
Servers 29
Server Clusters 32
Virtual Servers 42
Common Server Commands 45
Managing HBAs 47
Managing Server Folders 52
Viewing Server Information 54
Topology Explorer Server Functions 62

4 Volumes

Introduction 66
Creating Volumes 67
Mapping Volumes to a Server 73
Import Data to Lowest Tier 80
Creating a Boot from SAN Volume 82
Modifying Volumes 86
Managing Volume Folders 91
Applying Replay Profiles 95
Copy, Mirror, and Migrate 97

Viewing Volume Information 100
Recycle Bin 108
Topology Explorer Volume Functions 109

5 Disks
Introduction 114
Viewing Tiers 115
Adding Disks to a Storage Center System 116
Configuring Storage 120
Rebalancing RAID 122
Managing Disks 126
Managed Disk Folders 130
Importing from External Device without Replication License 133
Non-Standard Storage Types 138

6 Controllers
Introduction 142
About Controller Virtual Ports 143
Viewing Controller Properties 144
Viewing Controller Status 146
Viewing FC Folders and Cards 150
Viewing iSCSI Cards 159
Creating a Remote Storage Center Connection 173
Configuring Remote Connections Using CHAP 181
Viewing SAS Cards 190
Rebalancing Local Ports 194

7 System Management
Setting Up a Storage Center 196
Configuring Local Ports 201
Configuring iSCSI IO Cards 211
Allowing Replications to/from Remote Systems 212
Viewing Licensed Applications 213
Configuring System Access via IP Filtering 214
Viewing Disk Space Usage Summary 220
SNMP Server 227
Viewing System Properties 229
Selecting RAID Stripe Width 230
Data Progression 232
Setting System Cache 234
Configuring Global Disk Spares 235
Adding Optional Information about Storage Center 236
Finding Unmanaged Hardware 237
Viewing Background Processes 240
Phoning Home 241
Viewing the System Log 243
Responding to the Alert Monitor 244
Monitoring Storage Space 247
Changing the Storage Alert Threshold 248
Adding Space 249

Adding a Controller 250
Shutting Down and Restarting 252
Upgrading Storage Center Software 253

8 Users and Groups
Introduction 262
User Privilege Levels 263
Viewing Users 264
Changing User Properties 268
Configuring User Volume Defaults 272
Managing User Groups 277

9 Data Instant Replay
Introduction 284
Viewing Replay Profiles 285
Applying Replay Profiles to Volumes 288
Viewing Volumes Attached to a Replay Profile 290
Creating Replay Profiles 292
Adding Replay Profile Rules 300
Managing Replay Profiles 305
Recovering Data 321

10 Remote Instant Replay
Introduction 328
Synchronous and Asynchronous Replications 329
Estimating Bandwidth 330
Disallowing Replications Between Storage Center Systems 331
Establishing Physical Connectivity 332
Defining a QoS 333
Creating Volumes on a Remote System 338
Mapping an Existing Volume to a Remote System 339
Creating Replications 341
Creating a Simulated Replication 342
Viewing Replications 346
Modifying Replications 348
Re-creating a Volume from a Replication 349

11 Charting Viewer
Introduction 352
Downloading and Installing Charting Viewer 353
Using Charting Viewer 353
Viewing Storage Center Charts 356
Printing a Chart 357
Saving a Chart as a PNG Image 358
Zooming In and Out 358

12 Additional Hardware
Introduction 360

Enclosures 360
Removing an Enclosure 371
Uninterruptable Power Supply (UPS) 373
Racks 374

13 IO Card Changes
I/O Card Change Wizard 380

A Storage Profiles
Overview 382
Changing User Volume Defaults 383
Storage Profiles Created by the System 384
Creating Custom Storage Profiles 385
Managing Storage Profiles 388
Manual Storage Mode 392

B Portable Volume
Introduction 398
List of Portable Volumes 398

C Enterprise Solid State Drives
Overview 402
Installation and Setup 403

D Configuring a UPS
Introduction 406
Configuring an APC™ UPS 406
Configuring a Liebert™ UPS 411

E Server HBA Settings
Introduction 416
Settings by HBA Vendor 416
Settings by Server Operating System 419

Glossary 425

Preface

Purpose

The *Storage Center System Manager User Guide* describes the Storage Center System Manager software that manages an individual Storage Center system.

Related Publications

Compellent Storage Center documentation consists of the following publications:

- *Storage Center System Manager Setup Guide*

  Describes how to set up a new Storage Center.

- *Storage Center System Manager Upgrade Guide*

  Describes how to upgrade Storage Center software from version 4.5.6 and above to version 5.5 and from version 5.0 and higher to version 5.5.

- *Storage Center Enterprise Manager User Guide*

  Describes how to use Enterprise Manager to view and manage one or more Storage Centers, as well as generate and view charts and reports on Storage Center usage statistics. In addition, describes how to use Remote Instant Replay to replicate Replays to one or more Storage Centers.

To download Dell Compellent product manuals, go to:

http://www.dell.com/manuals

Contacting Dell Support Services

Please contact Dell Technical Support Services from the following address if you need support assistance:

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1 Introduction

What's New in this Release 2
Introducing the Storage Center System Manager 7
Starting the Storage Center System Manager 7
Possible Messages on System Manager Startup 9
Navigation 12
View Menu 14

What's New in this Release

Congratulations on making the move to Fluid Data storage from. The new Fluid Data architecture combines a powerful data movement engine, virtualized software applications and an agile hardware platform to intelligently manage data at a more granular level. The patented technology optimizes performance, lowers costs and increases storage utilization.

Storage Center 5.5

iSCSI Configure IO Card Wizard Improvements

All iSCSI cards are now configurable using the iSCSI Configure IO Cards wizard. In previous releases, only uninitialized cards could be configured via this wizard. In addition, all iSCSI IO cards detected by the system can now be configured from a single window rather than configuring cards one at a time on separate windows. This functionality can be accessed via the Startup Wizard and via Storage Center System Explorer through multiple paths.

Search Capability added to GUI

A search capability has been added to the bottom of the system tree in System Explorer. The search feature provides the ability to search through the system tree for objects . A dropdown menu allows filtering objects by type: All (default), Volumes, Disks, Servers. Left and right arrows allow navigating forward and back. An arrow to the left of the search field allows you to minimize/maximize the search function. A checkbox is provided to match case.

Configure Local Ports Changes

Front-end values for Fibre Channel ports attached an enclosure can no longer be set via the Configure Local Ports wizard. In support of this change, a Enclosure Connected column has been added to the FC ports table (virtual port and legacy port modes).

Demoting Volume Mappings from a Server Cluster to an Individual Cluster Node

In earlier versions of Storage Center, users were required to demote server cluster mappings one at a time. In this version, users can demote multiple cluster mappings at the same time using the Demote Mappings to Server Cluster Nodes window.

Restore Deleted User Wizard

The Restore Deleted User wizard enables users to select the deleted user to be restored and provide a new password for the restored user.

Allow Replays to Coalesce into an Active Replay

The Volume Properties screen now displays an option to allow Replays for the displayed volume to coalesce into the active Replay. This option is unselected by default. As part of this change, the Space Consumption Limit and Import Data To Lowest Tier options have also been moved from the General tab to the new Advanced tab of the Volume Properties window.

OpenVMS Unique Disk IDs Displayed

The Volume Properties screen now allows the user to set the Open VMS Unique Disk Id for the volume. This attribute is used by Open VMS to uniquely identify the volume. It is ignored by other operating systems.

Log Filter Improvements

Users can now select a log filter timeframe from a dropdown menu on the Filter Log Messages window. On dual-controller systems, logging can be set per controller. The default is to show all log messages.

Enabling / Disabling Secure Console Access

If secure console access to the Storage Center was configured, menu options to restart and disable this access are now available on the Storage Management > System menu. The new menu options provide easy access to common secure console actions previously available only within the Configure Secure Console wizard.

Storage Center 5.4

Model 40 Storage Controller (CT-SC040)

The Model 40 storage controller is based on the SuperMicro X8DTH-iF motherboard with Intel Nehalem chipset technology.

Fibre Channel over Ethernet – 10Gb

This release adds Fibre Channel over Ethernet (FCoE) capabilities to the product line via the QLogic FCoE CNA QLE8152 IO card. This card provides PCI Express dual 10Gbps Ethernet ports with full hardware offload for FCoE protocol processing. While the QLE8152 is capable of standard TCP/IP and Ethernet processing, Storage Center only supports the card for FCoE capabilities. The card must be connected to a CISCO Nexus 5000 series switch.

Fibre Channel – 8Gb

This release provides a second source for 8Gb Fibre Channel interfaces via the QLogic QLE2564 PCI Express, quad port, Fibre Channel adapter. This card provides functional equivalence to the existing Emulex 8Gb Fibre Channel card and can be used in addition to as well as a replacement for the Emulex card.

SAS – 6 Gb

This release provides the next step in performance and scalability of the storage back-end technology with the introduction of SAS 2.0 compliant 6G IO cards to communicate with new SAS 2.0 6G compliant enclosures and disk drives. The LSI SAS 9200-16e is a quad wide port full height PCI-e card with support for 16 lanes of 6Gb interfaces. The initial release of SAS 6G provides support for 48 devices per chain, with the ability to have two chains of devices per IO Card. SAS connections are described in greater detail in the *Storage Center 5.4 SAS Connections Guide*, document number 680-049-001.

iSCSI Card – Enhanced 10Gb Support

This release provides 10Gb iSCSI support for additional network interface, switches, and server operating systems beyond what was available in the previous release, including support for the Chelsio S320E-CR (PCIe based) adapter. This is a dual-port IO card utilizing the Chelsio T3 (terminator 3) ASIC for 10 Gb offload processing.

IO Card Change Wizard

The new IO Card Change Wizard provides a user interface within the Storage Center System Manager to the utility used to map hardware changes to existing configurations. The wizard can be used for IO card upgrades and removals or when upgrading controllers. For more information, see *Storage Center 5.4 I/O Change Wizard*, document number 685-001-001 available through Dell Support Services.

Storage Center 5.3

iSCSI Card – Limited 10 Gigabit Support

This release introduces limited support for the Chelsio S320E-CR 10Gbps iSCSI card.

Configure Operational Mode

Legacy and Virtual Port operational mode can be selected during initial system setup for a new Storage Center when Virtual Ports are licensed. This feature is described in the *Storage Center System Setup Guide*, document number 680-022-007. After initial system setup, ports can be configured within Storage Center Manager by using the **Configure Local Ports** wizard.

Configure Local Ports Wizard

The redesigned Configure Local Ports wizard combines Legacy and Virtual Port configuration in a single wizard. The Configure Local Ports screen displays a list of controllers, slots, and ports present on the Storage Center. For each IO card and port used on each controller, you can specify a network value of front end or back end and a usage of primary or reserved.

iSCSI Qualified Names (IQNs)

In previous releases, servers were created using WorldWide Names (WWNs) for HBAs. Users now have a choice when creating servers — WWN or iSCSI Name. The default is iSCSI Name. For server ports, the iSCSI name is a user-defined string that might follow the conventional iSCSI Qualified Name (IQN) format, but does not have to, and is intended to be globally unique. The Storage Center does not impose the IQN format for servers and enforces uniqueness only within a single Storage Center system.

Storage Center 5.2.2

Server Cluster

Storage Center 5.2.2 enables the selection of volumes to be promoted to a server cluster when creating the cluster. Previously, all volumes mapped to server nodes were automatically promoted to the Server Cluster. Once a volume is mapped to a Server Cluster, it can be demoted from the Server Cluster to a server node. When a volume is mapped to a server node, it can be promoted to a Server Cluster.

Import Mode

Import Mode allows you to import data directly to the lowest configured tier of storage.

Advanced Mapping Display

An option exists to allow advanced mapping information to be displayed. By default, this option is turned off.

Storage Center 5.2.1

RAID 6

In addition to RAID 10 and RAID 5-5/5-9, Storage Center allows you to select RAID 6 for any storage tier. RAID 6 provides greater storage redundancy and efficient use of disks.

Secondary DNS Server

Users now have the option of entering a secondary DNS server. If a path is not available to the primary DNS server, the Storage Center connects to the secondary DNS server.

Import from External Device

Previously, a synchronous replication license was required for data to be loaded from an external device. Now the command to Import from an External Device and Classify Disk as External are available without a synchronous replication license. Import from External Device uses synchronous replication to import data from a non-Storage Center device.

Storage Center 5.1

System Dashboard

The license window that appeared in previous versions of the System Manager is replaced with a System Dashboard that displays used and available storage space, and a history of storage use. The Dashboard lets you monitor your space more efficiently. The license window is available from the Help menu.

Storage Center 5.0

Virtual Ports

Virtual Ports eliminate the need for reserve ports. When operating in Virtual Port mode all front-end ports accept IO.

Consistency Groups

Consistency Groups create a synchronized Replay of all volumes within the consistency group while the IO stream on all volumes is halted. This creates a consistent data set. Consistency Groups can also be replicated to other Storage Centers.

Mapping

Storage Center adds the ability for you to identify the operating system of each server so that it can map Volumes to Servers based on the rules of the operating system of the server.

Portable Volume

A Portable Volume is a removable USB drive that moves large quantities of data between replicating systems to establish a baseline replication. Portable volumes are configured in Enterprise Manager.

Leibert™ UPS

Storage Center 5 supports the Liebert Uninterruptable Power Supply. The UPS is now managed through SNMP.

SAS

Storage Center 5 supports SAS (Serial Attached SCSI) protocol enclosures and disks. SAS achieves data transfer speeds on four wide lanes of each SAS port

Introducing the Storage Center System Manager

The Storage Center System Manager:

- Provides a central management interface to create and manage Storage Center volumes, servers, disks, and users.
- Displays the status of hardware components.
- Enables local and remote backup and restore.
- Provides Phone Home technical support.
- Allows multiple users to have different levels of access privileges.

In addition to the System Manager, Storage Center provides a rich set of separately-licensed applications that support dynamic storage. To view currently licensed applications, from the Help menu, select Licensed Features.

Note Figures in this document show views, menus, and options displayed when logged in with Administrator privileges. If you are logged in as a Volume Manager or Reporter, what you see displayed may differ from the figures and options described in this User Guide.

Starting the Storage Center System Manager

Access Storage Center System Manager from a workstation or PC on the same network as the Storage Center controller. View the Storage Center System Manager through one of these browsers:

- Microsoft Windows Internet Explorer Versions 7, 8, and 9
- Mozilla Firefox Version 3 on Microsoft Windows

If you log on using an unsupported browser, the system returns a warning stating that some functions of the Storage Center software may not function as expected.

Note The Storage Center System Manager cannot load with the following unique combination of applications: Windows 2008 (64 bit), FireFox 3.0, and Java Runtime Environment 6_10.

To start Storage Center System Manager

1. In the address bar of the web browser, enter the name or IP address of the Management controller. (This was configured during setup.) A security alert appears.
2. Click **Yes** to acknowledge the alert. The Storage Center System Manager login window appears.

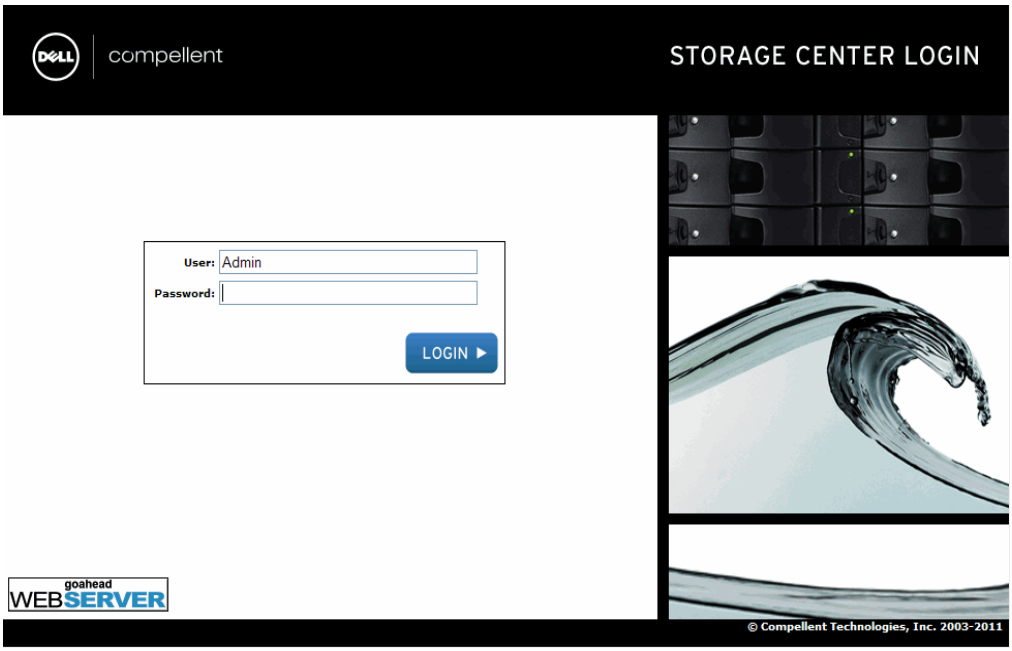


Figure 1. Login Window

3 In the User ID field, enter the default ID:

```
Admin
```

4 Enter the default password:

```
mmm
```

5 Click **Login**. If an additional security alert appears, click **Yes** to continue.

Note The End User License Agreement is displayed the first time a new user logs onto the Storage Center. Click **Accept** to continue.

Possible Messages on System Manager Startup

Unbalanced Local Ports

If a controller has been added or taken offline, ports can become unbalanced. The Startup wizard warns you if local ports are unbalanced.

To balance unbalanced ports

Click **Yes** to rebalance local ports.

To turn off the rebalance ports message

1. Select the Controllers node.
2. From the shortcut menu, select **Rebalance Local Ports**.
3. Uncheck the option to check for unbalanced local ports at startup.

IO Card Change Detected

If an IO card change is detected on system startup, Storage Center will automatically launch the IO Card Change Wizard. For information about this wizard, refer to I/O Card Change Wizard on page 380.

Unmanaged Hardware

If the System Manager finds unmanaged hardware, such as disks or server host bus adaptors (HBAs), it prompts you to manage them. For more information on managing unassigned disks, refer to Adding Unassigned Disks to a Folder on page 119. For more information on HBAs, refer to Managing HBAs on page 47.

Viewing the System Explorer

When the system recognizes the user name and password, the System Explorer opens.

- **Storage Management menu**: Displays Storage Center commands.
- **Shortcut menu**: The shortcut menu appears when you select a component. It is displayed at the top of the System Explorer below the menus as well as when you right-click an component. The Shortcut menu displays commands specific to the selected component.
- **System Tree**: Shown in the left frame of the System Explorer, the System Tree displays logical and physical components.
- **View menu**: Displays different views of the system.
- **Alert Monitor**: Displays component status. Click the System Status button to view additional information including the system log.
- **Advisor Pages**: Most windows, include advisor pages with additional information about commands and information displayed in the window. To open an advisor page, click on the Advisor button.

System Dashboard

The center frame of the System Explorer opens to the System Dashboard.

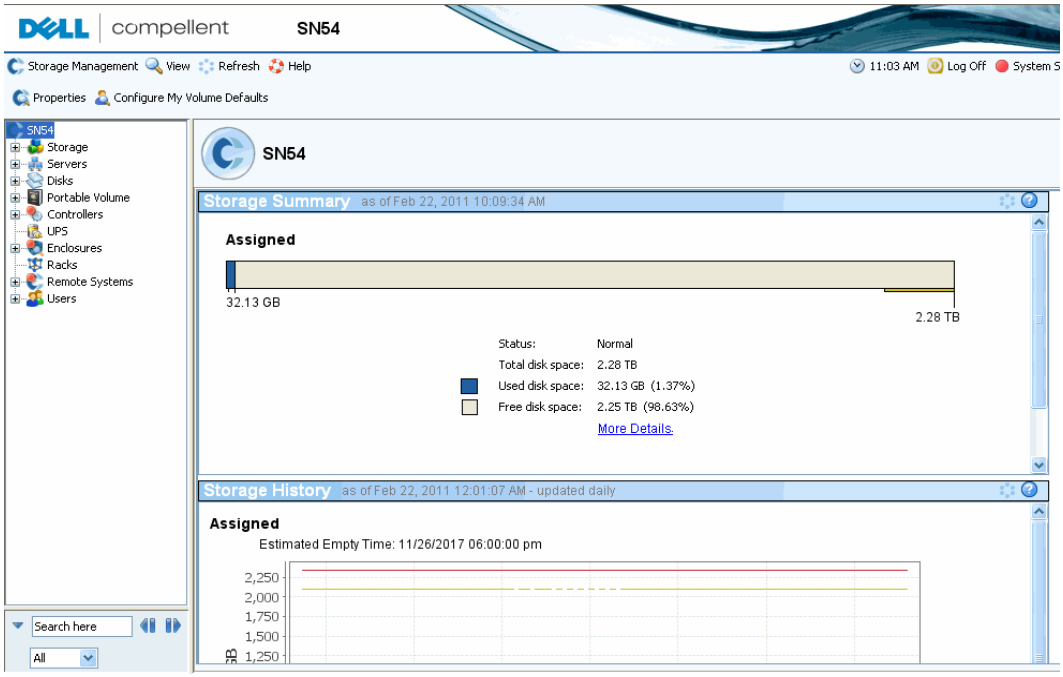


Figure 2. System Explorer View

The Storage Summary displays:

- Date and time the summary report was generated
- Status: Normal or Space Low. Space Low indicates that you must add storage.
- Total disk space: The amount of raw disk space available.
- Used disk space: Space used by volumes and replays (blue on the bar graph)
- Free disk space: Space available for volumes and replays (gray in the bar graph).
- Unhealthy/Bad space (if any) Space found on any unhealthy disks, or any bad space found on disks which are healthy. This appears only if unhealthy or bad disk space has been found (black in the bar graph).
- A bar graph on the right edge of the window shows the Storage Alert Threshold. If free space falls below the Low Space Threshold, the System Manager sends an alert, warning you to add additional disks.
- Search function in the lower left provides the ability to search through the system tree for objects with matching names. A dropdown menu allows filtering objects by type: All (default), Volumes, Disks, or Servers. A checkbox is provided to match case (default). Left and right arrows allow you to navigate forward and backward. The arrow to the left of the search field allows you to minimize/maximize the search panel.

Storage History

The Storage History displays an overview of past storage use:

- Numbers on the left showing the amount of disk space in GB.
- Blue line shows the amount of space used recently.
- Red line shows the amount of raw disk space available.
- Yellow line shows the Storage Alert Threshold

Note In rare instances, a Storage Center system will have more than one disk folder. In this case, the System Manager displays a Storage Summary and Storage History for each disk folder.

Navigation

Storage Management Menu

To view System Manager commands, click the Storage Management menu, directly below the title bar.

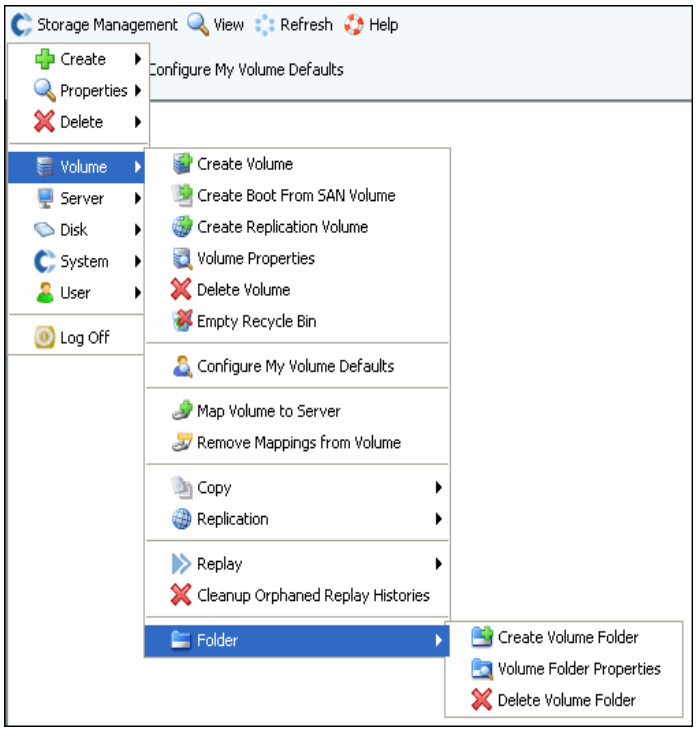


Figure 3. Storage Management Menu

System Tree

Expand component folders in the System Tree to view component status.

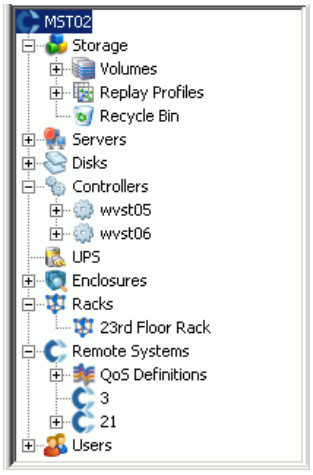


Figure 4. System Tree

Shortcut Menu

Select an item in the system tree to view a shortcut menu for that item. Commands in the shortcut menu also appear at the top of the System Explorer window.

If there is not sufficient room to display all shortcut menu commands at the top of the window, a down arrow is displayed. Click the arrow to display all commands shown in the shortcut menu.

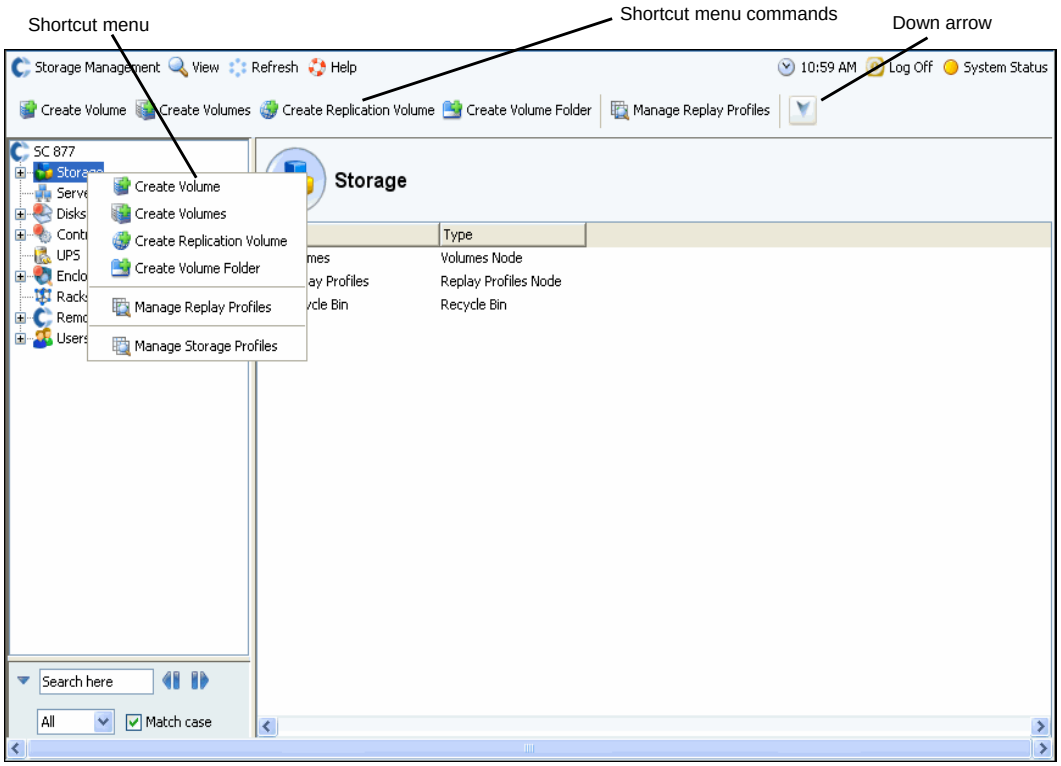


Figure 5. Shortcut Menu

Selecting Multiple Components

To perform one command on multiple similar components:

1 In the system tree, select a component folder, such as Volumes or Assigned Disks.

2 In the main window, using the **Shift** or **Ctrl** key, select multiple objects. The shortcut menu above the main window displays commands available to multiple objects. For example, clicking on the Volumes folder icon and selecting volumes in the main window allows you to delete multiple volumes at once or move multiple volumes to a new folder.

View Menu

Click **View** to open the View menu.

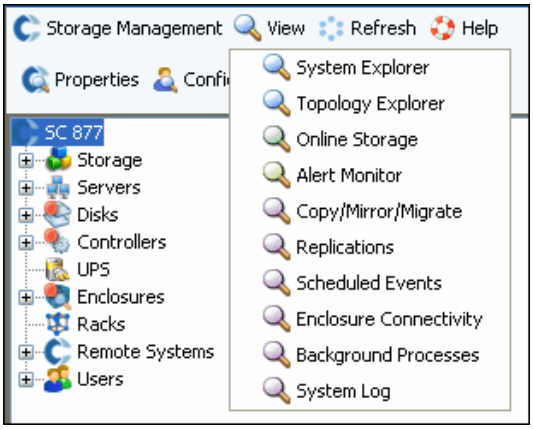


Figure 6. View Menu

The **View** menu provides multiple ways to configure a system or view system properties. Options are specific to each individual view. To display the view menu, click the **View** menu at the top of the Storage Center window.

Once a View window is open, the tab for that view appears at the top of the window.

Figure 7. Open View Tabs

If a tab is displayed, click the tab to display the view window. View windows remain open during a Storage Management session. Close a view window and tab by clicking on the X in the right corner of the tab. If more tabs are available than can be displayed, click the scroll arrows at the far right of the tabs to scroll through the open tabs. Selecting a view that is already opened displays the window; it does not open a second window. Set Update Frequency, Find, and Scroll Setting appear at the top of most views.

2 Quick Start Guide

Introduction 16
Step 1. Manage Unmanaged Hardware 16
Step 2. Change Admin Password 17
Step 3. Create Servers 18
Step 4. Configure Your User Volume Defaults 20
Step 5. Create Multiple Volumes 23
Step 6. Monitor Alerts - Ongoing 25

Introduction

Though Storage Center has many sophisticated commands, the following six steps allow you to initially manage a Storage Center system.

A fully redundant system has no single point of failure, as long as a failing physical component is replaced in a timely manner. Storage Center monitors all of the physical components, including storage space consumed and available. User properties allow you to enter up to three telephone numbers (include cell phones) to IT personnel. Alerts inform you of system and component status.

Step 1. Manage Unmanaged Hardware

It is assumed that the hardware attached to the Storage Center controller was identified during Installation. If not, Storage Center recognizes unmanaged hardware and asks that you manage it. If all hardware is managed, turn to Step 2 on page 17.

Storage Center groups disks into a disk folder to create one pool of storage from which volumes are created. By using one disk folder, you maximize Thin Provisioning and Dynamic Capacity. Managing unassigned disks means to move them into a managed disk folder.

To manage unassigned disks

1. In the system tree, expand **Disks**.
2. Open the **Unassigned Disk Folder**.
3. From the list of disks, select disks to be managed. For the most efficient use of the Storage Center, select all the disks.
4. Click **Continue**. The **Select Hot Spare** window appears. A hot spare replaces a failed disk. It is held in reserve until needed. A spare disk must be as large or larger than the largest disk in the disk folder. At least one hot spare must be reserved for each enclosure. The system selects the optimal disk to be a spare. Accept the default or select one or more disks to be used as a hot spare(s).
5. Click **Continue**. The disk folder confirmation window appears. The default name for the disk folder is **Assigned**. Enter another name or accept the default. Optionally, enter notes for the folder.
6. After verifying all disk folder information, click **Create Now**. The system asks you to confirm. Click **OK.**
7. Select a **Disk Folder**.
8. From the shortcut menu, select **Configure Storage**. The System Manager combines the disks into a single pool of storage from which to create volumes.
9. When the system informs you of the type of storage that it prepared, click **Close**.

Note If the system asks you to Rebalance RAID devices, select **Rebalance Now**. For more information, refer to Rebalancing RAID on page 122

Step 2. Change Admin Password

Note You must be an administrator to change this password.

To change the Admin password

1. In the system tree, click the **Users** icon to view users.
2. Select the an icon, such as Admin.
3. From the shortcut menu, select **Change User Password**. The **Change User Password** window appears.
4. Enter and re-enter a password.
5. Click **OK**. The password is changed.

Step 3. Create Servers

To create a new FC or iSCSI server

1 In the Storage Management window, select the servers folder.

2 From the shortcut menu, select **Create Server**. The **Create Server** wizard appears, listing HBAs recognized by the Storage Center.

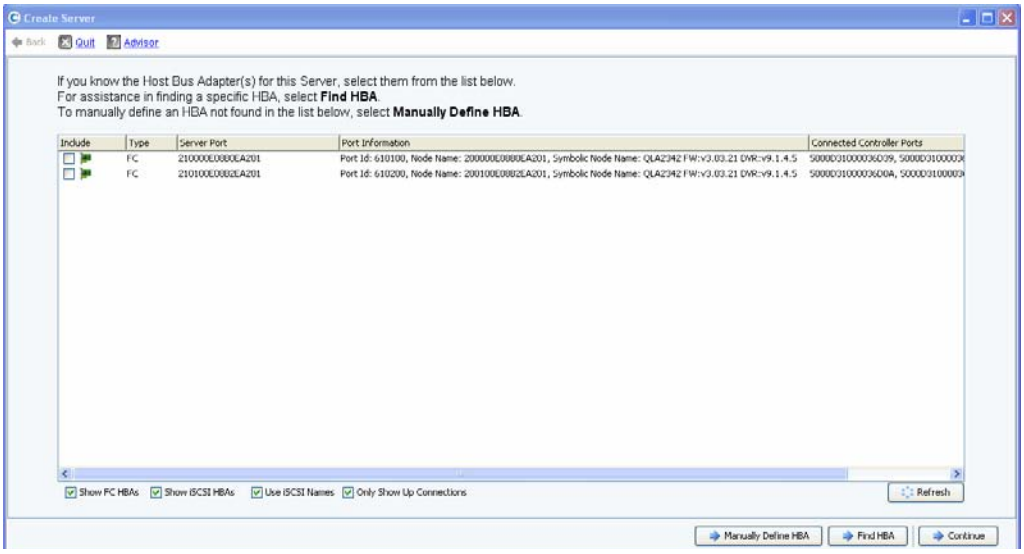


Figure 8. Create Server

3 Select one or more HBAs and click **Continue**. A window appears asking you to name the server.

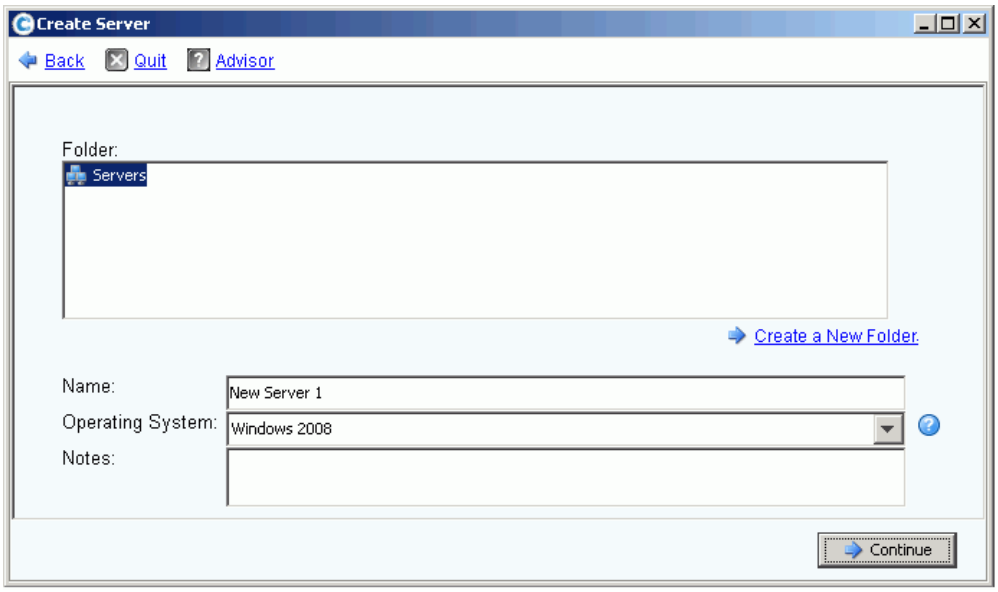


Figure 9. Name Server

4 Enter a name for the server or accept the default.

5 From the drop-down menu, select an operating system for this server. Volumes will be mapped to this server according to the rules of the operating system of the server.

6 Select an existing server folder or create a new server folder. To create a folder at this time, click **Create a New Folder.** Enter a folder name and any notes (up to 255 characters). Click **OK**.

7 Click **Continue**.

8 Click **Create Now**. The commands that appear in this window depend on the action you just completed.

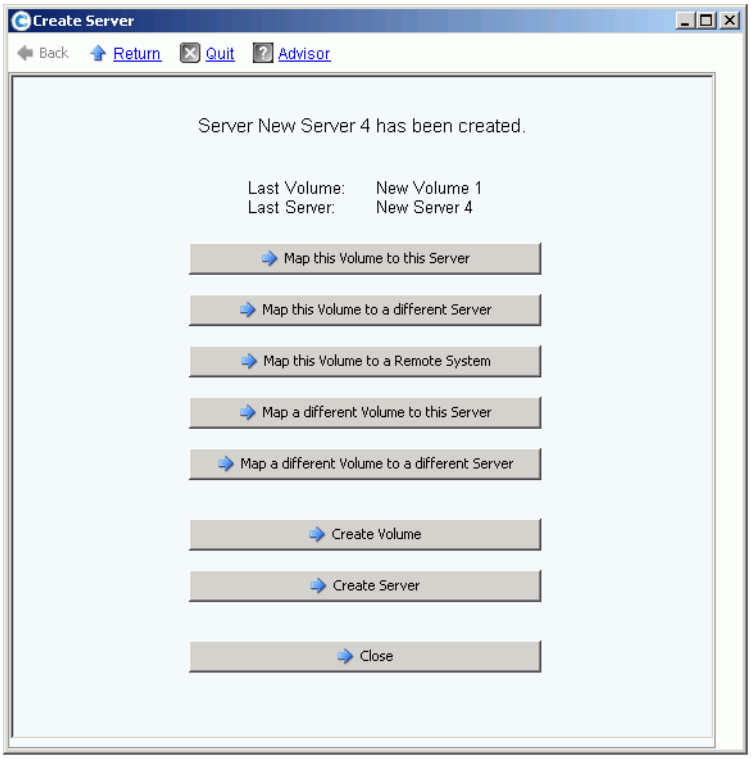


Figure 10. Server Created Window

9 Click **Close**.

Step 4. Configure Your User Volume Defaults

There are defaults for volumes you create. You can change properties for any individual volume, but if you are going to create many volumes, streamline the process by configuring the volume defaults.

To configure your user volume defaults

1 In the system tree, click the **Users** icon to view users.

2 Select your user icon, such as Admin.

3 From the shortcut menu, select **Configure User's Volume Defaults**. The **Configure User Volumes Defaults** window appears.

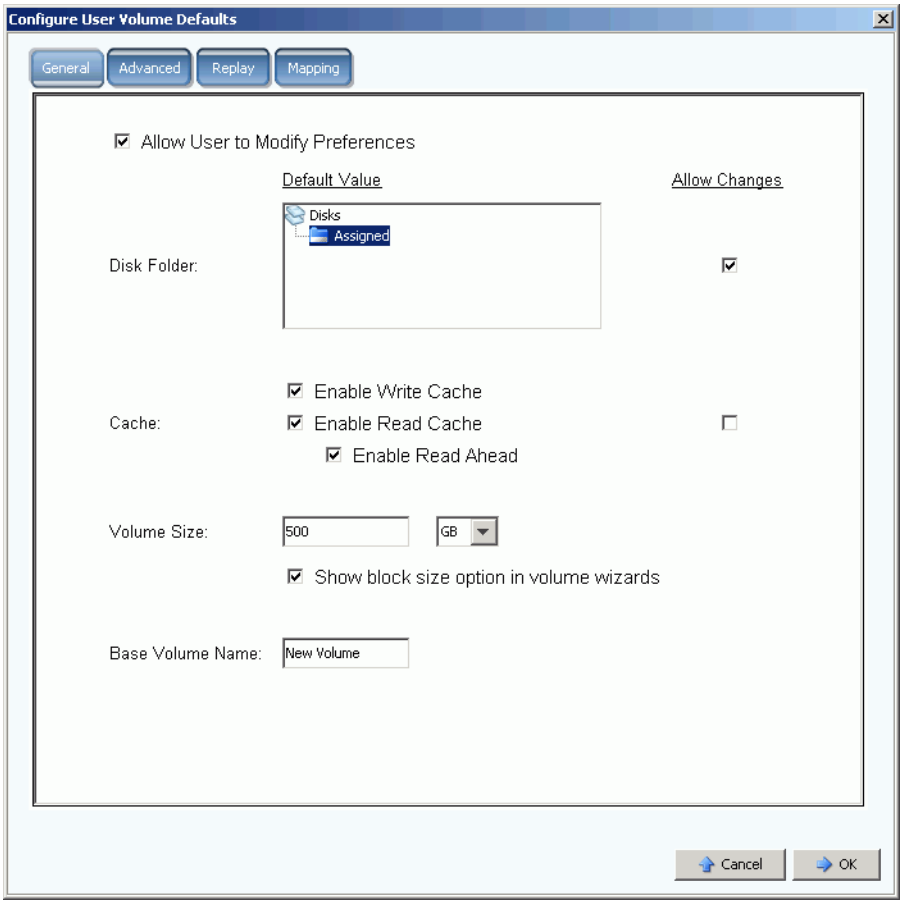


Figure 11. General User Volume Defaults

4 Select a default disk folder from which to draw storage. The default is the folder you created in Step 1 on page 16.

5 If you enabled system-wide cache in setup, enable or disable cache for volumes you create. Check or clear the **Allow Changes** box to the right of the **Cache** options.

6 Enter a **Volume Size**. The default is 500 GB. Remember, this space is not reserved, only allocated. This means that you can allocate more disk space than you actually have. You need to add additional disks when the space actually used reaches 80% of total physical space.

7 Select or disable **Show block size in volume wizards**.

8 Enter a **Base Volume Name**. When you create many volumes at once, the System Manager increments this name by one. As you quickly add volumes, the names appears as New Volume 1, New Volume 2, New Volume 3, etc.

Set Volume Replay Defaults

Volume Replays defaults set the default Replay schedule for volumes you create.

To configure volume Replays

1 In the **Configure User Volumes Defaults** window, select the **Replay** tab. The default Replay schedule appears.

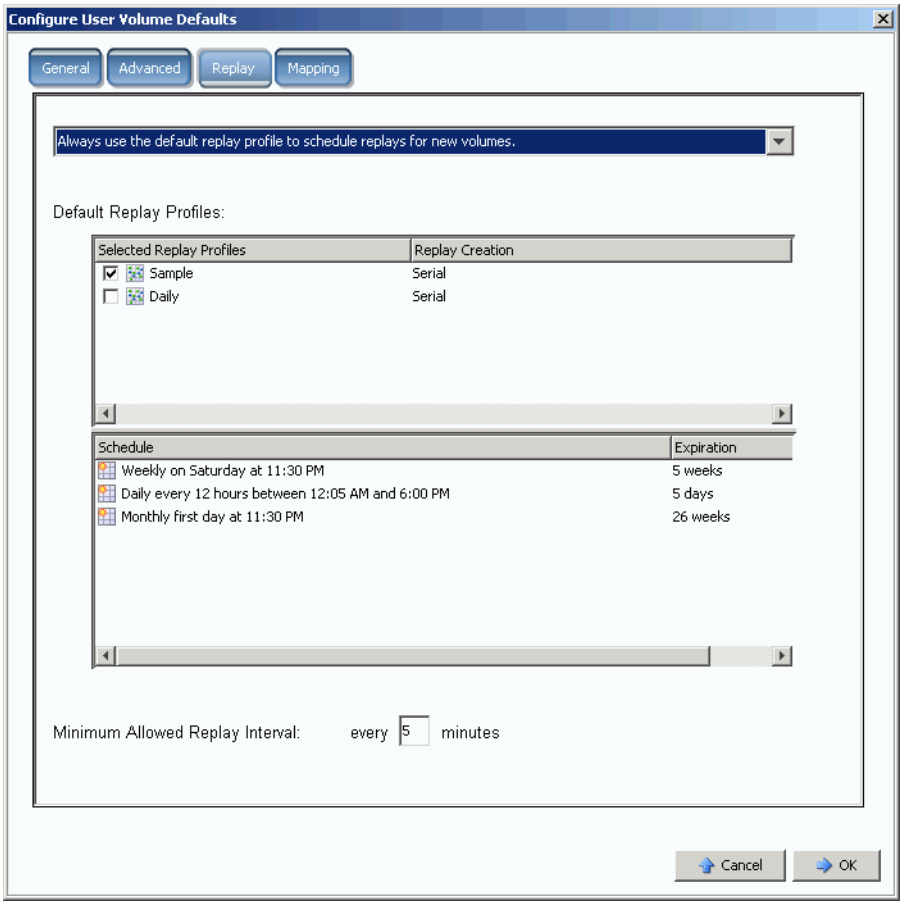


Figure 12. Set Volume Replay Defaults

2 From the dropdown menu at the top of the window, choose to be queried for a Replay schedule when you create a volume or to automatically use the default Replay schedule for new volumes.

3 Select a default **Replay Profile**. The rules in these two Replay Profiles cannot be changed. (To create your own Replay schedule, refer to the instructions in Creating Replay Profiles on page 292.)

4 Enter a **Minimum Allowed Replay Interval** or accept the default. A minimum allowed Replay restricts the intervals between Replays.

Set Mapping Defaults

Mapping Defaults selects a default sever to which to map volumes.

To configure mapping defaults

1 In the **Configure User Volumes Defaults** window, click on the **Mapping** tab.

2 From the servers you created in Step 3 on page 18, select a server to which to automatically map the volumes you create. For more information on mapping options, including advanced options, refer to User Volume Defaults - Mapping on page 275.

Confirm user volume defaults

When you have changed volume defaults, click **OK**. Volumes you create will be created with these defaults.

Step 5. Create Multiple Volumes

To create multiple volumes

1 In the system tree, select **Storage**.

2 From the shortcut menu, select **Create Volumes**. The **Create Volumes** window appears.

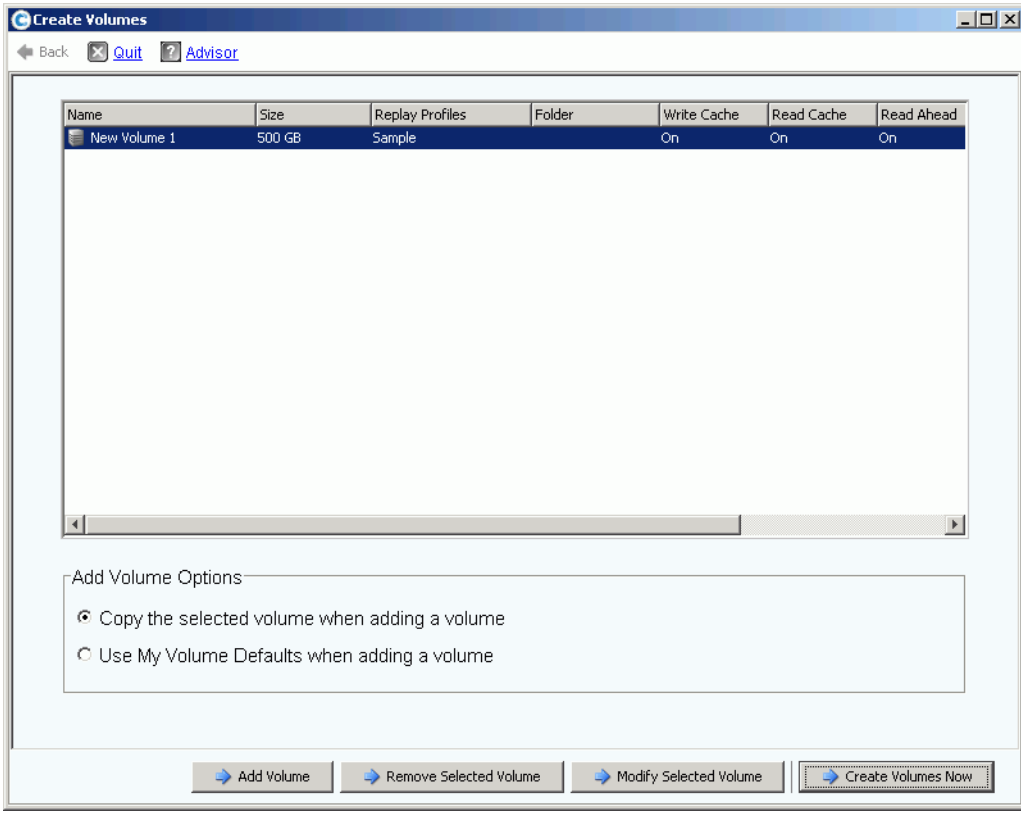


Figure 13. Create Multiple Volumes

3 Select **Use My Volume Defaults when adding a volume**. (The **Copy the selected volume when adding a volume** command lets you add volumes based on properties other than your volume defaults.)

4 Continue to click **Add Volume** for as many volumes as you want to create.

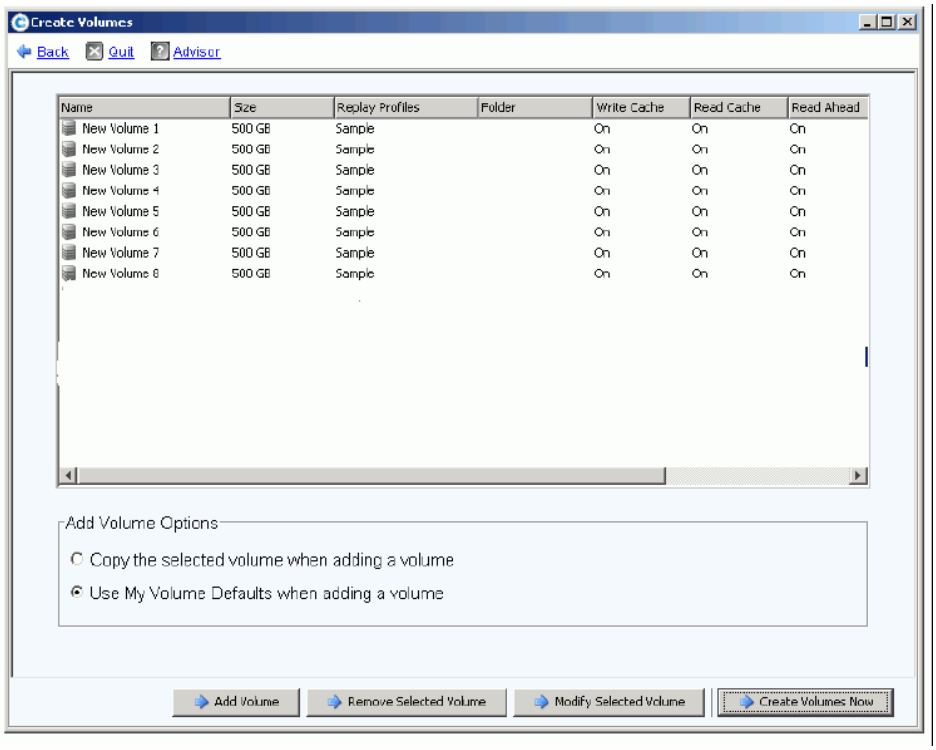


Figure 14. Added Volumes

5 When you have added sufficient volumes, click **Create Volumes Now**. (This may take several minutes. The system advises you of its progress.)

When the creating volume window closes, the system manager displays the first volume you created. Volume type is **Dynamic Write** until Storage Center creates the first Replay. Data can now be written to the volumes.

Step 6. Monitor Alerts - Ongoing

Add Space as Required

Disk drives that are managed by the Storage Center are contained in a disk folder, which is simply a logical grouping of physical drives. Disk folders can contain a mixture of drive types, capacities, and speeds. The total capacity of the disk folder is the sum of the capacities of the drives within the folder. Disk folders also contain disk drives that are specified as hot spares. Hot spare drives are reserved for use as replacement drives in the event another disk in the disk folder fails. Since the space on these hot spares is never used until another drive fails, their capacity is not included in the total capacity for the disk folder.

Storage Center allocates disk space from a disk folder for volume and Replay use as needed based upon the configurations and IO patterns of each volume. As the Storage Center approaches the end of the disk space available within the disk folder, it will generate an alert, warning you to add additional space.

Conservation Mode

Storage Center enters Conservation Mode when remaining free space reaches 32 GB (or less for systems smaller than 3.2 TB). When Storage Center enters conservation mode, the system generates a Conservation Mode Alert to inform you that the system will not allow new volumes to be created and that it will begin to aggressively expire Replays. The Conservation Alert is close to the boundary where space is exhausted to keep these actions from being performed unless necessary. Because of its proximity to the emergency threshold, it is not a tool to manage storage, and should not be used to plan adding additional disks to the system.

Emergency Mode

Emergency threshold means that the system can no longer operate because there is no more free space. Storage Center:

- Generates an emergency alert
- Expires Replays early
- Will not permit new volumes to be created
- All volumes are taken offline

When Storage Center reaches the Emergency threshold, all server IO is rejected until the system gets out of Emergency Mode. Because this is service affecting, special care should be taken to monitor free space on the system to avoid reaching this threshold. Volumes will not be able to be brought back online until enough space is freed to exit the emergency state. Before a system reaches Emergency Mode, it is critical that you add space. Refer to Conservation Mode on page 25.

Monitor Physical Components

Alerts warn you of component failure when the Storage Center requires attention. The status of the Storage Center is indicated by the color of the System Status icon in the top-right corner of the System Manager.

- Red (Critical) The System Status icon appears red when an alert exists that has a status of Down, Critical, or Emergency. When the System Status icon is red, this indicates a condition that requires immediate attention.

- Yellow (Warning) The System Status icon is yellow when an alert exists that has a status of Degraded or Unavailable. This indicates a condition of which you should be aware, but which does not require immediate attention.
- Green (Normal) The System Status icon appears green when no alerts exist, when the only alerts that exist are to inform you. The System Status icon returns to green when all alerts higher than Inform are acknowledged.

To view the System Alert monitor

Click **System Status** at the top of the System Explorer. The **Alert Monitor** view appears. Click the **Alerts** folder to view all alerts.

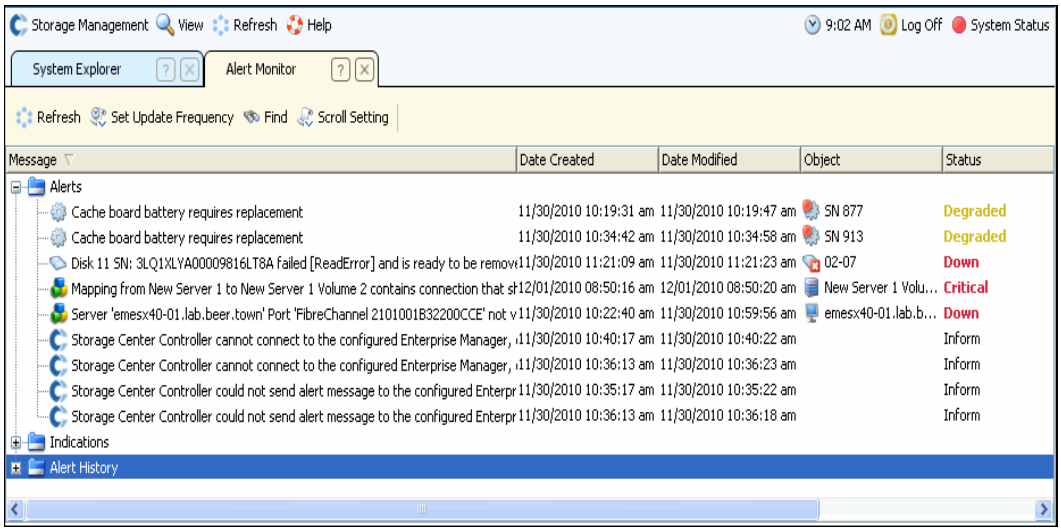

Storage Management
View
Refresh
Help
9:02 AM
Log Off
System Status
System Explorer
Alert Monitor
Refresh
Set Update Frequency
Find
Scroll Setting
Message
Date Created
Date Modified
Object
Status
Alerts
Cache board battery requires replacement 11/30/2010 10:19:31 am 11/30/2010 10:19:47 am SN 877 Degraded
Cache board battery requires replacement 11/30/2010 10:34:42 am 11/30/2010 10:34:58 am SN 913 Degraded
Disk 11 SN: 3LQ1XLYA00009816LT8A failed [ReadError] and is ready to be remove 11/30/2010 11:21:09 am 11/30/2010 11:21:23 am 02-07 Down
Mapping from New Server 1 to New Server 1 Volume 2 contains connection that sh 12/01/2010 08:50:16 am 12/01/2010 08:50:20 am New Server 1 Volu... Critical
Server 'emesx40-01.lab.beer.town' Port 'FibreChannel 2101001B32200CCE' not v 11/30/2010 10:22:40 am 11/30/2010 10:59:56 am emesx40-01.lab.b... Down
Storage Center Controller cannot connect to the configured Enterprise Manager, 11/30/2010 10:40:17 am 11/30/2010 10:40:22 am Inform
Storage Center Controller cannot connect to the configured Enterprise Manager, 11/30/2010 10:36:13 am 11/30/2010 10:36:23 am Inform
Storage Center Controller could not send alert message to the configured Enterpr 11/30/2010 10:35:17 am 11/30/2010 10:35:22 am Inform
Storage Center Controller could not send alert message to the configured Enterpr 11/30/2010 10:36:13 am 11/30/2010 10:36:18 am Inform
Indications
Alert History

Figure 15. Alert Monitor

Selecting an alert displays additional information about the system message. To view more information about an alert, select an **Alert**. The shortcut menu displays additional commands.

1. Click **Show** to display the object in the System Manager. Some alerts do not have a related object to be shown. For these alerts, the **Object** column is blank.
2. To acknowledge an alert, select **Acknowledge**. Acknowledging an alert acknowledges it for all users.
3. Click the **Advanced** tab in the **Alert Properties** window to display a reference number. The reference number may be important for communication with Dell Support Services.

3 Servers

Introduction 28
Servers 29
Server Clusters 32
Virtual Servers 42
Common Server Commands 45
Managing HBAs 47
Managing Server Folders 52
Viewing Server Information 54
Topology Explorer Server Functions 62

Introduction

This chapter describes how to create, manage, and monitor servers. Defining a server enables Storage Center to pass IO through the ports on that server. Once a server is created, volumes can be mapped to it. Storage Center automatically recognizes FC IO cards within the network to which is connected. iSCSI IO cards must be configured either during setup or as they are added to the network. A remote Storage Center can act as a server to a local Storage Center for Replication, as described in Remote Instant Replay on page 327.

Servers can be organized into server folders either to make them easier to manage or as a means to restrict access to servers, as described in Users and Groups on page 261.

Several servers can be combined into a Server Cluster. The Storage Center views the Server Cluster as one server. Volumes can be mapped to the Server Cluster or to a server that is a member of the cluster. Refer to Creating a Server Cluster on page 32

One server or server cluster can be the host of one or more virtual servers. Each virtual server can have a different operating system. The Storage Center views each virtual server as a separate entity. Volumes mapped to one virtual server are not mapped to other virtual servers residing on the same server. Refer to Creating a Virtual Server on page 42.

Server Icons

In the System Tree, the System Manager uses icons to denote the server type.

Icon	Server Type
	Server Node - all servers
	Folder
	Server
	Server Cluster
	Virtual Server
	Remote Systems Node
	HBA Node - FC, iSCSI, or SAS - resides under the controller node

Servers

Note For information on preparing an iSCSI server that is recognized by a Storage Center system, refer to the *Storage Center Setup Guide.*

Creating a Server

Creating a server means to identify it to a Storage Center system by using the **Create Server** wizard. If you are using iSCSI CHAP, add remote CHAP initiators to communicate with the server. Refer to Adding a Remote CHAP Initiator on page 182.

To create a server

1 In the system tree, select the servers node.

2 From the shortcut menu, select **Create Server**. The **Create Server** wizard appears. The wizard lists Host Bus Adapters (HBAs) recognized by the Storage Center.

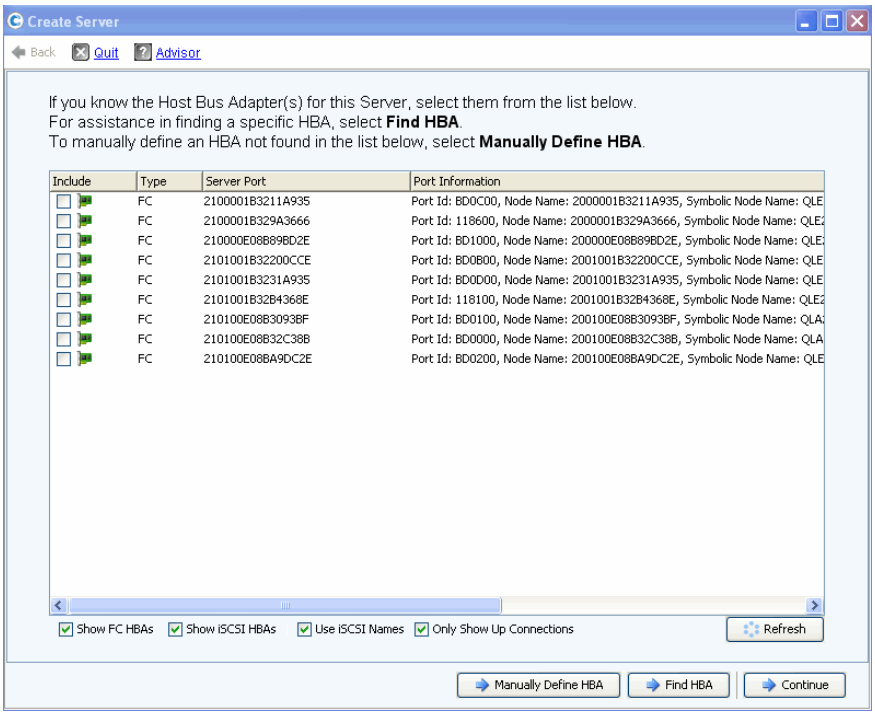

Create Server
Back
Quit
Advisor
If you know the Host Bus Adapter(s) for this Server, select them from the list below.
For assistance in finding a specific HBA, select Find HBA.
To manually define an HBA not found in the list below, select Manually Define HBA.
Include
Type
Server Port
Port Information
FC 2100001B3211A935 Port Id: BD0C00, Node Name: 2000001B3211A935, Symbolic Node Name: QLE
FC 2100001B329A3666 Port Id: 118600, Node Name: 2000001B329A3666, Symbolic Node Name: QLE2
FC 210000E08B89BD2E Port Id: BD1000, Node Name: 200000E08B89BD2E, Symbolic Node Name: QLE2
FC 2101001B32200CCE Port Id: BD0B00, Node Name: 2001001B32200CCE, Symbolic Node Name: QLE
FC 2101001B3231A935 Port Id: BD0D00, Node Name: 2001001B3231A935, Symbolic Node Name: QLE
FC 2101001B32B4368E Port Id: 118100, Node Name: 2001001B32B4368E, Symbolic Node Name: QLE2
FC 210100E08B3093BF Port Id: BD0100, Node Name: 200100E08B3093BF, Symbolic Node Name: QLA2
FC 210100E08B32C38B Port Id: BD0000, Node Name: 200100E08B32C38B, Symbolic Node Name: QLA
FC 210100E08BA9DC2E Port Id: BD0200, Node Name: 200100E08BA9DC2E, Symbolic Node Name: QLE
Show FC HBAs
Show iSCSI HBAs
Use iSCSI Names
Only Show Up Connections
Refresh
Manually Define HBA
Find HBA
Continue

Figure 16. List of Available HBAs

3 Select one or more HBAs. For information on finding an HBA, refer to Finding an HBA on page 48.

Note If you select an iSCSI HBA, you have the option to create the server using WWNs or iSCSI Qualified Names (IQNs) for HBAs. Default is iSCSI Name.

4 Click **Continue**. A window allowing you to name the server appears.

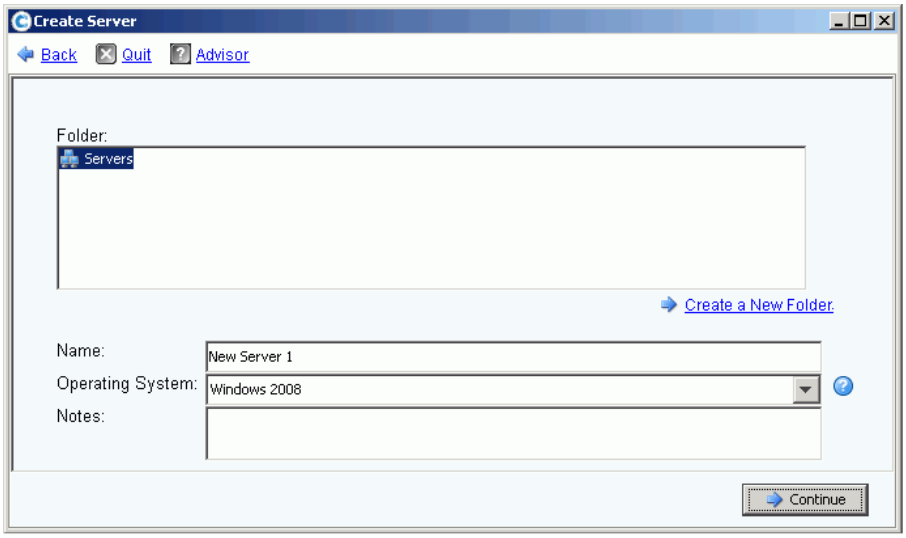


Figure 17. Name Server Window

5 Enter a name for the server or accept the default. Enter a folder name and any notes (up to 255 characters).

6 From the drop-down menu, select an operating system (OS) for the server. Default is Windows 2008. All servers must have an OS defined. Expand operating system folders to view operating system versions.

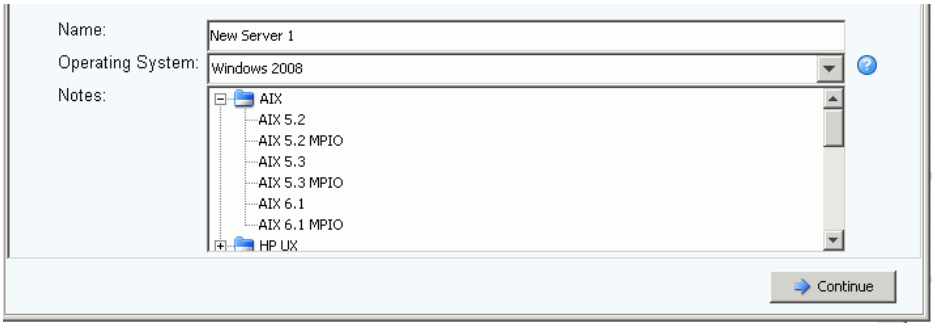


Figure 18. Example of an Expanded Operating System Folder

7 Volumes are mapped to servers according to the rules of the server operating system. To view rules of an operating system, select a system.

8 Click **Continue**. The screen displays the name and attributes of the server. Click the question mark icon. A window opens displaying rules for the selected operating system.

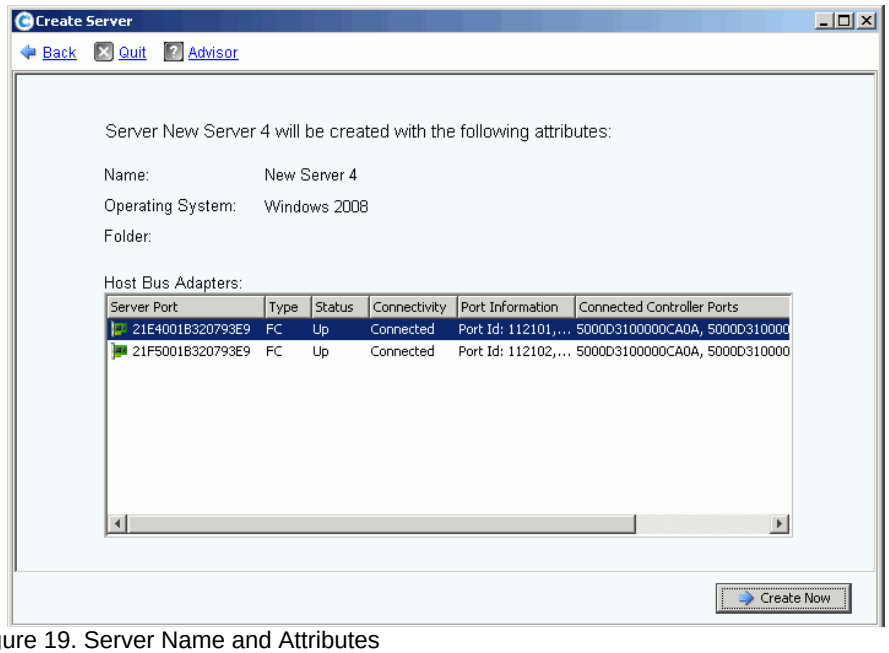


Figure 19. Server Name and Attributes

9 Click **Create Now**. On the next window, choose from the following options:

- **Map the server to a Volume**
- **Map a different Server to a Volume**
- **Create Volume**
- **Create Server**

10 Close the **Create Server** wizard

Note For a short time after a server is created, it may appear in the system tree with an error icon while Storage Center re-evaluates its server connectivity. When the System Manager is refreshed, the error icon disappears when the server is visible to Storage Center.

Server Clusters

A server cluster is a collection of servers. A server that is a member of a server cluster is referred to as a *cluster node*. Volumes can be mapped directly to a server cluster. All volumes mapped to a server cluster are automatically mapped to all nodes in the cluster. This increases IO efficiency and, if one server fails, IO continues to other servers within the cluster. Volumes can also be mapped to only one of the nodes within the server cluster.

Some operating systems require that a volume mapped to multiple cluster nodes use the same LUN on each node. When creating a server cluster, Storage Center attempts to map an included volume to the same LUN on all cluster servers. If the LUN selected is not available on a particular server, the mapping is not performed and the volume is only partially connected to the cluster.

Note All servers within a server cluster must have the same operating system.

Creating a Server Cluster

1 In the system tree, select the servers node.

2 From the shortcut menu, select **Create Server Cluster**.

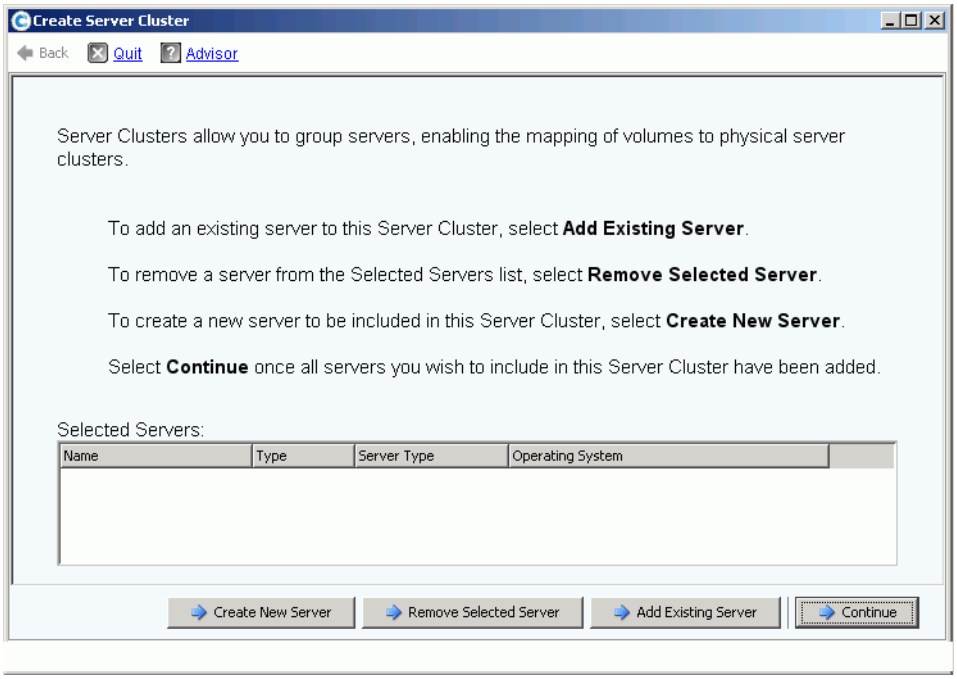

Create Server Cluster
Back
Quit
Advisor
Server Clusters allow you to group servers, enabling the mapping of volumes to physical server clusters.
To add an existing server to this Server Cluster, select Add Existing Server.
To remove a server from the Selected Servers list, select Remove Selected Server.
To create a new server to be included in this Server Cluster, select Create New Server.
Select Continue once all servers you wish to include in this Server Cluster have been added.
Selected Servers:
Name
Type
Server Type
Operating System
Create New Server
Remove Selected Server
Add Existing Server
Continue

Figure 20. **Create Sever Cluster** Wizard

3 Choose one of the buttons at the bottom of the window and follow the instructions in the wizards.

Creating New Servers for Server Cluster

1 Select **Create New Server**.

2 Follow Steps 3 though 9 for creating a server, starting on page 29. When you select **Create Now**, the **Create Server Cluster** window shown in Figure 20 reappears.

To create a second server to add to a server cluster

1 Select **Create New Server**.

2 Repeat Steps 3 through 9, starting on page 29.

Note All servers in the server cluster must have the same operating system. If a server is incorrectly selected to be in the cluster, use the **Remove Selected Server** button to remove the server from the list before creating the server cluster.

3 When all the servers that will be part of this cluster are listed, click **Continue**. A window allowing you to name the server cluster appears.

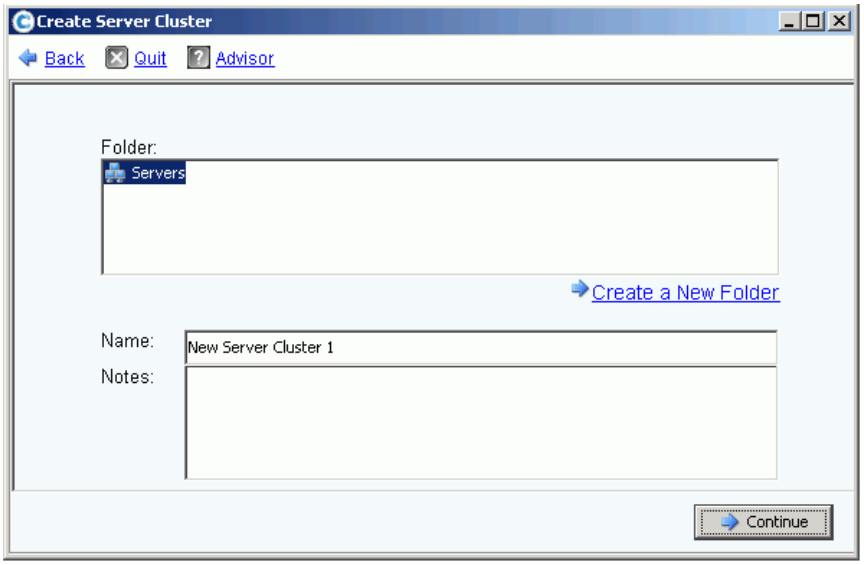


Figure 21. Name Server Cluster Window

4 Name the server cluster or accept the default. Add notes if necessary.

5 Click **Continue**. The system asks you to confirm.

6 Click **Create Now**.

7 On the next window, map volumes to the server cluster or click **Close**.

Notice that the server cluster appears in the system tree.

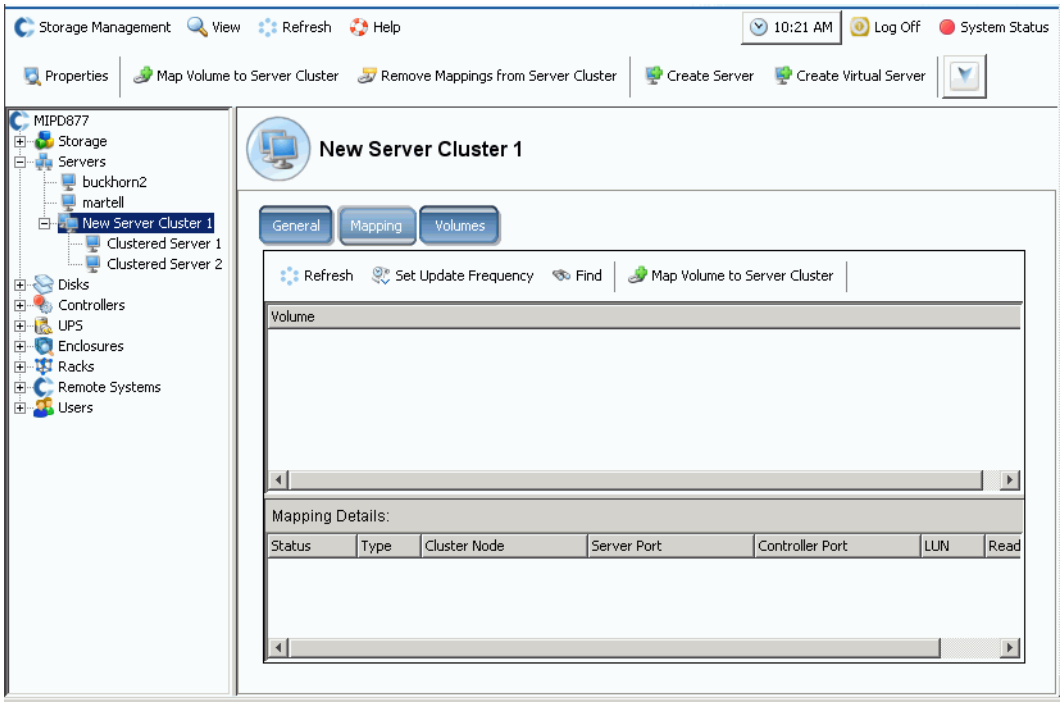


Figure 22. System Tree Showing Server Cluster

Adding a Server to a Server Cluster

1 In the Create Server Cluster window, select **Add Existing Server**.

2 Expand a server folder to view servers within the folder, if necessary, and select a server.

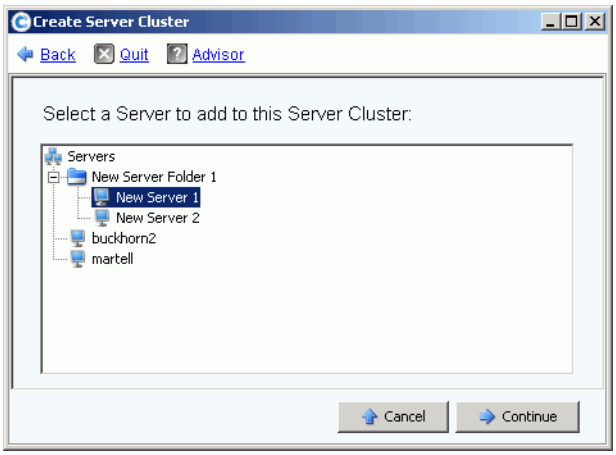


Figure 23. Select Server to Add to Cluster

3 Click **Continue**. The **Create Server Cluster** window reappears.

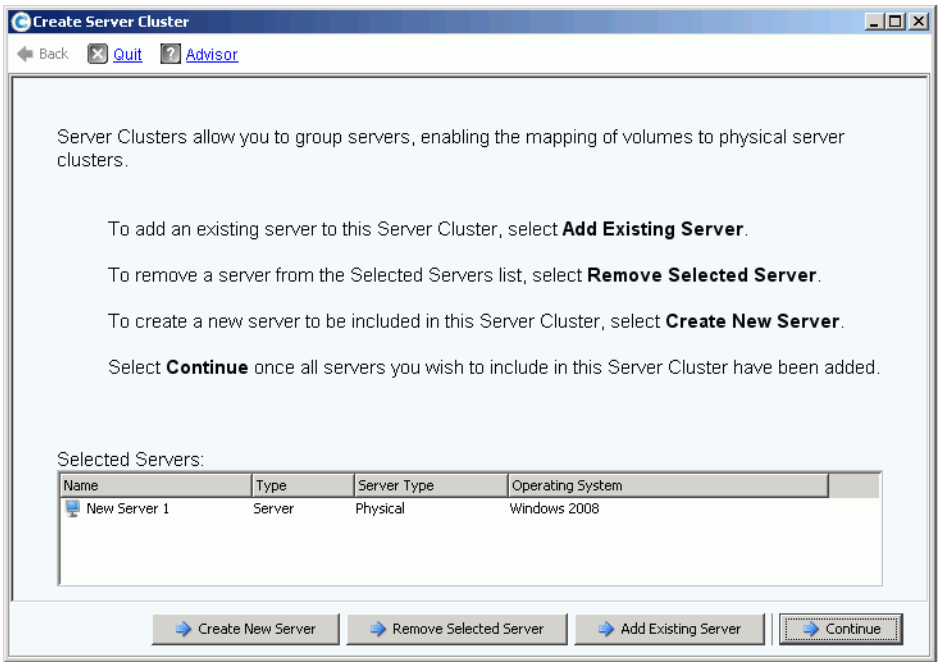

Create Server Cluster
Back
Quit
Advisor
Server Clusters allow you to group servers, enabling the mapping of volumes to physical server clusters.
To add an existing server to this Server Cluster, select Add Existing Server.
To remove a server from the Selected Servers list, select Remove Selected Server.
To create a new server to be included in this Server Cluster, select Create New Server.
Select Continue once all servers you wish to include in this Server Cluster have been added.
Selected Servers:
Name
Type
Server Type
Operating System
New Server 1
Server
Physical
Windows 2008
Create New Server
Remove Selected Server
Add Existing Server
Continue

Figure 24. **Create Server Cluster** Window

4 Add another server by clicking **Add Existing Server** again. The **Create Server Cluster** window reappears with the servers listed in the **Select Servers** frame. The window displays the operating systems of the selected servers.

Note All servers in the server cluster must have the same operating system. If a server is incorrectly selected to be in the cluster, use the **Remove Selected Server** button to remove the server from the list before creating the server cluster.

5 Once the **Create Server Cluster** window displays all the servers for this server cluster, click **Continue**. A window allowing you to name the server cluster appears.

6 Name the server cluster or accept the default. Add notes if necessary.

7 Click **Continue**. If volumes were mapped to individual server nodes, the system displays a list of mapped volumes and asks you to select volumes to map to the server cluster. By default, the system selects all volumes mapped to the server nodes, except boot volumes; by default, boot volumes are not selected to be mapped to the server cluster.

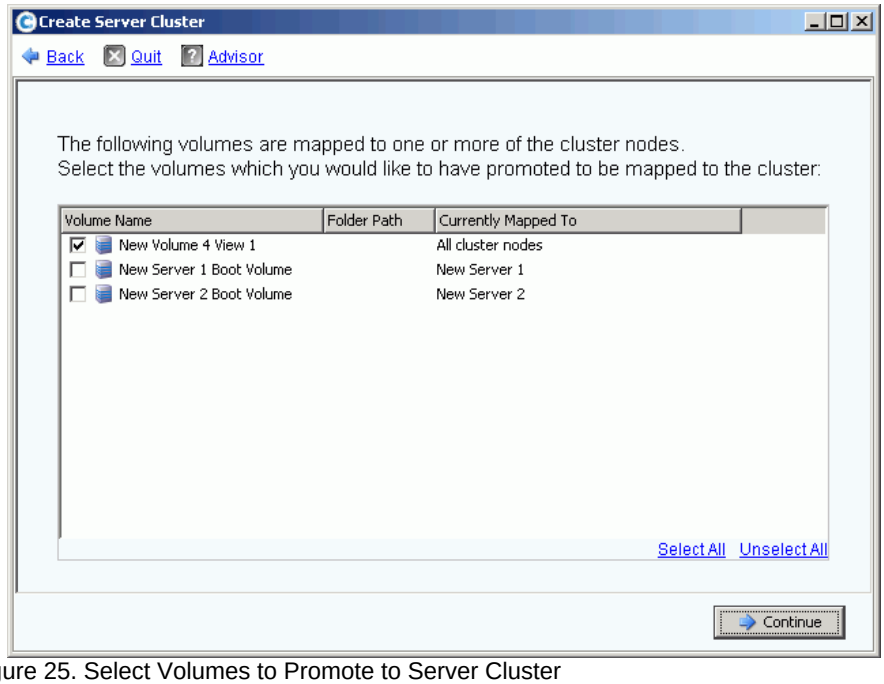


Figure 25. Select Volumes to Promote to Server Cluster

8 Click **Continue**. The system asks you to confirm.

9 Click **Create Now**.

10 From the next window, map volumes or click **Close**. Notice that the server cluster appears in the system tree.

Creating a Server Cluster from Selected Servers

1 In the system tree, select the server node or other server folder. A list of servers in that folder appears.

2 In the main window, select servers to be added to the server cluster.

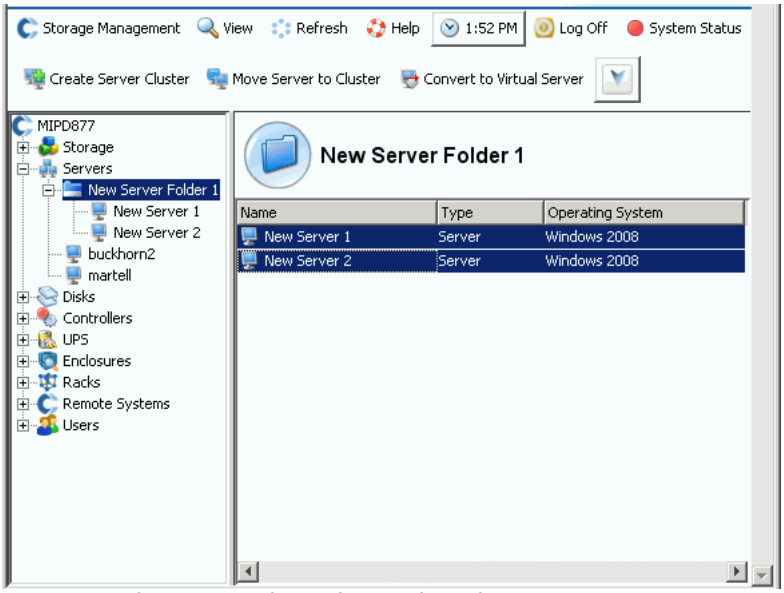


Figure 26. Creating Server Cluster from Selected Servers

3 From the shortcut menu, select **Create Server Cluster**. The **Create Server Cluster** window appears with the servers you selected.

Note All servers in the server cluster must have the same operating system. If a server is incorrectly selected to be in the cluster, use the **Remove Selected Server** button to remove the server from the list before creating the server cluster.

4 Click **Continue**. A window allowing you to name the server cluster appears.

5 Name the server cluster or accept the default. Add notes if necessary.

6 Click **Continue**. If volumes were mapped to individual server nodes, the system displays a list of mapped volumes.

7 Select volumes to map to the server cluster. By default, the system selects all volumes mapped to the server nodes, except boot volumes.

8 Click **Continue**.

9 The system asks you to confirm.

10 Click **Create Now**.

11 On the next window, map volumes or click **Close**. Notice that the servers were moved from the server folder to the new server cluster.

Moving an Existing Server to a Server Cluster

1 In the system tree, select a server that is a not a member of a server cluster. From the shortcut menu, select **Move Server to Cluster**. The **Move Server to Cluster** window appears with a list of server clusters.

2 Select a server cluster.

3 Click **Continue**. The system asks you to confirm.

4 Click **Apply Now**. Volumes that were mapped to the server cluster are now mapped to the server that was added.

Removing a Server from a Server Cluster

1 In the system tree, select a server that is a member of a server cluster. From the shortcut menu, select **Remove Server from Cluster**. The **Remove Server from Cluster** window appears.

2 Click **Remove Now**. Because volumes mapped to the server cluster are mapped to all servers within the cluster, removing a server from a cluster does not affect volumes mapped to the cluster.

Removing Multiple Servers from a Server Cluster

1 In the system tree, select a server cluster.

2 From the shortcut menu, select **Remove Servers from Cluster**. The system displays a list of servers that are members of this cluster.

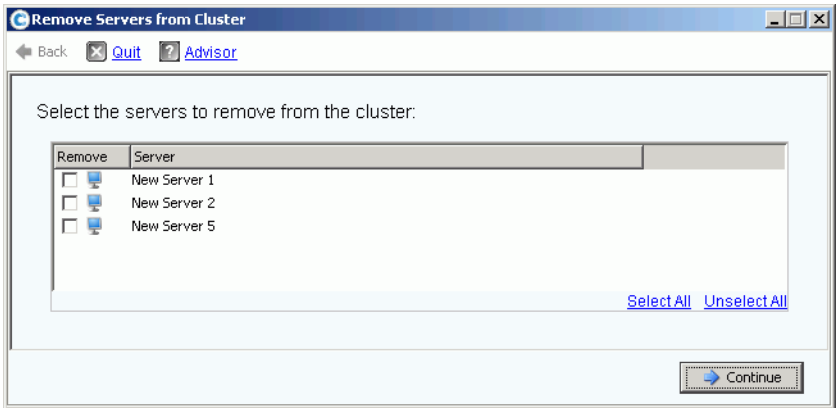


Figure 27. Remove Servers from Cluster

3 Select one or more servers to remove. Click **Continue**.

4 The system asks you to confirm. Click **Remove Now**.

Deleting a Server Cluster

Before you can delete a server cluster, you must remove or delete all the server nodes within the server cluster.

To delete a server cluster

1. Make sure all nodes that were part of the cluster are removed or deleted. In the system tree, select an empty server cluster.
2. From the shortcut menu, select **Delete**. The system asks you to confirm.
3. Click **OK**.

Promoting and Demoting Server Cluster Mappings

The Storage Center allows users to demote mappings from server clusters to the individual cluster nodes and to allow users to promote mappings from individual cluster nodes to a server cluster.

To promote server cluster mappings

Once a volume has been mapped to a server node, it can be promoted from that server node to a server cluster.

1. In the system tree, select a server cluster.
2. From the shortcut menu, select **Promote Mappings to Server Cluster**. The **Promote Mappings to Cluster** window appears.

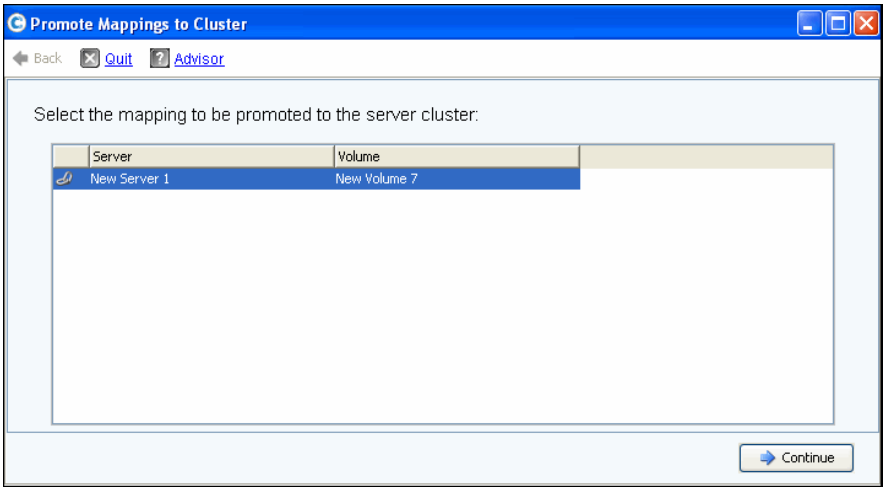


Figure 28. Select Mappings to Promote

3. Select the mapping to promote by highlighting it.

4 Click **Continue**. The resulting window displays the volume selected for promotion and the name of the server cluster to which it will be mapped.

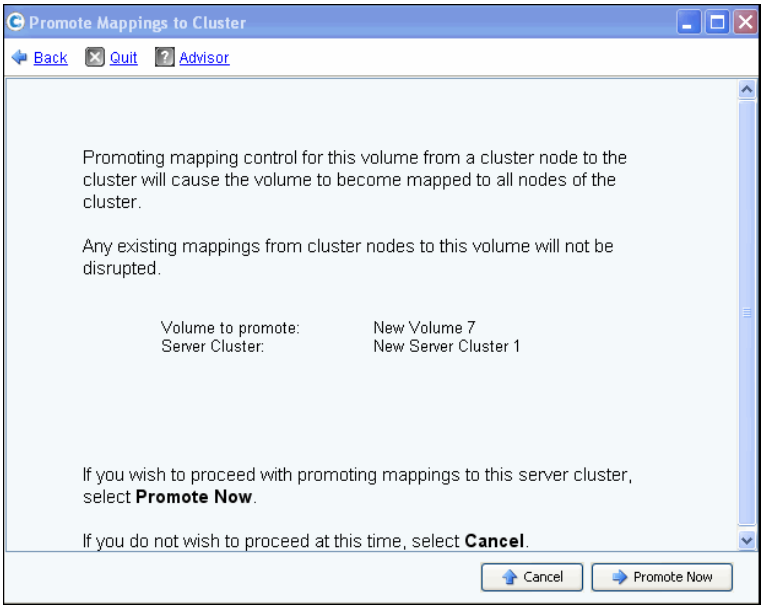

Promote Mappings to Cluster
Back
Quit
Advisor
Promoting mapping control for this volume from a cluster node to the cluster will cause the volume to become mapped to all nodes of the cluster.
Any existing mappings from cluster nodes to this volume will not be disrupted.
Volume to promote: New Volume 7
Server Cluster: New Server Cluster 1
If you wish to proceed with promoting mappings to this server cluster, select Promote Now.
If you do not wish to proceed at this time, select Cancel.
Cancel
Promote Now

Figure 29. Promote Selected Mappings

5 Click **Promote Now** to promote volume mappings or click **Cancel** to exit.

To demote server cluster mappings

Once a volume has been mapped to a server cluster, it can be demoted from that server cluster to a server node.

1 In the system tree, select a server cluster.

2 From the shortcut menu, select **Demote Mappings to Server Cluster Nodes**. The **Demote Mappings to Cluster Nodes** window appears showing current mappings.

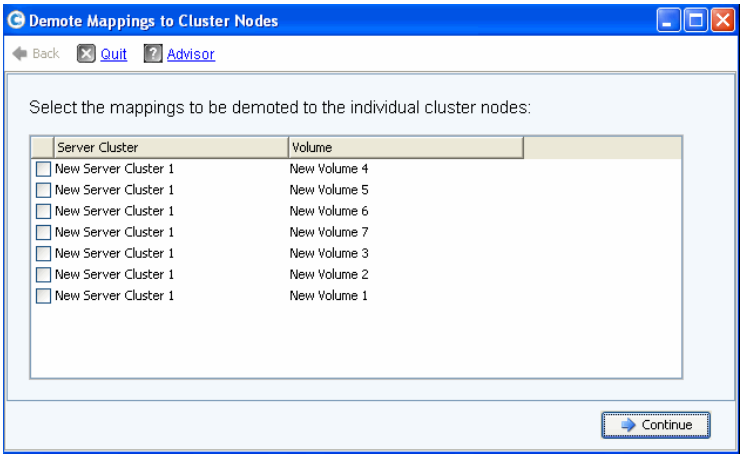

Demote Mappings to Cluster Nodes
Back
Quit
Advisor
Select the mappings to be demoted to the individual cluster nodes:
Server Cluster
Volume
New Server Cluster 1 New Volume 4
New Server Cluster 1 New Volume 5
New Server Cluster 1 New Volume 6
New Server Cluster 1 New Volume 7
New Server Cluster 1 New Volume 3
New Server Cluster 1 New Volume 2
New Server Cluster 1 New Volume 1
Continue

Figure 30. Select Mappings to Demote

3 Use the check boxes to select mappings to be demoted.

4 Click **Continue**. The resulting window lists servers in the cluster and the volumes that are mapped to the servers.

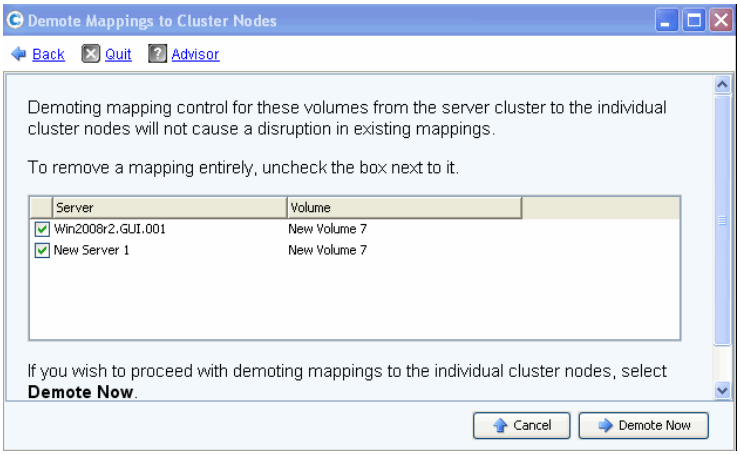

Demote Mappings to Cluster Nodes
Back
Quit
Advisor
Demoting mapping control for these volumes from the server cluster to the individual cluster nodes will not cause a disruption in existing mappings.
To remove a mapping entirely, uncheck the box next to it.
Server
Volume
Win2008r2.GUI.001
New Volume 7
New Server 1
New Volume 7
If you wish to proceed with demoting mappings to the individual cluster nodes, select Demote Now.
Cancel
Demote Now

Figure 31. Demote Selected Mappings

- Checked server mappings will be demoted from the cluster to the server. By default, all server mappings are checked.
- Unchecked server mappings will be deleted from the server.

5 Click **Demote Now** to demote volume mappings or click **Cancel** to exit.

Virtual Servers

Creating a Virtual Server

1 In the system tree, select a server.

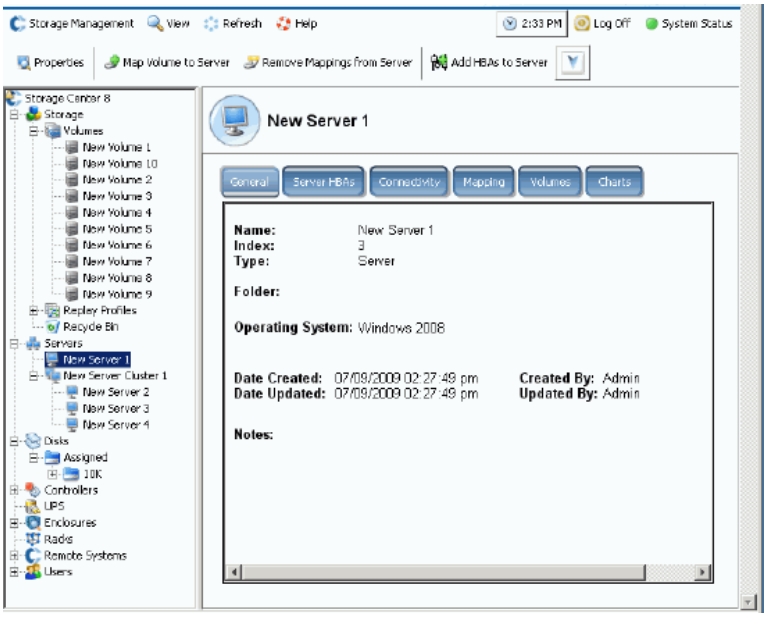


Figure 32. Select Server

2 From the shortcut menu, select **Create Virtual Server**. A list of available HBAs appears.

3 Click **Continue**. A window allowing you to name virtual server appears.

4 Enter a name or accept the default.

5 From the drop-down menu, select an operating system that can act as an OS for a virtual machine, such as Windows 2008.

6 Enter notes, if necessary.

7 Click **Continue**. A confirmation window appears.

8 Click **Create Now**. The virtual server appears under the host server you selected.

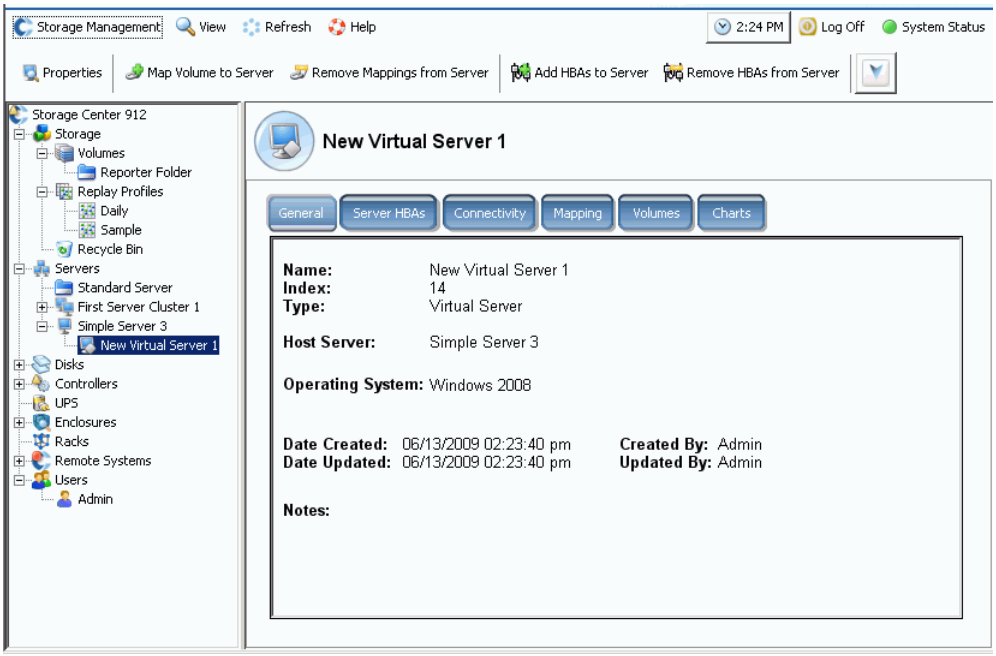


Figure 33. Virtual Server in System Tree

There is no limit on the number of virtual servers you can create on a server.

Converting a Server to a Virtual Server

1 In the system tree, select a server.

2 From the shortcut menu, select **Convert to Virtual Server**. The system asks you to select a host server or server cluster for the selected servers.

Note The destination server or server cluster must be running an operating system that can act as a virtual server host, such as VMWare ESX or Windows 2008.

3 In the system tree, select a server or server cluster. Click **Continue**. A confirmation window appears.

4 Click **Convert Now**. The clustered server is converted to a virtual server.

Converting a Virtual Server to a Physical Server

To convert a virtual server into a server

1 From the system tree, select a virtual server. From the shortcut menu, select **Convert to Server**. The **Convert Virtual Server to Physical Server** window appears.

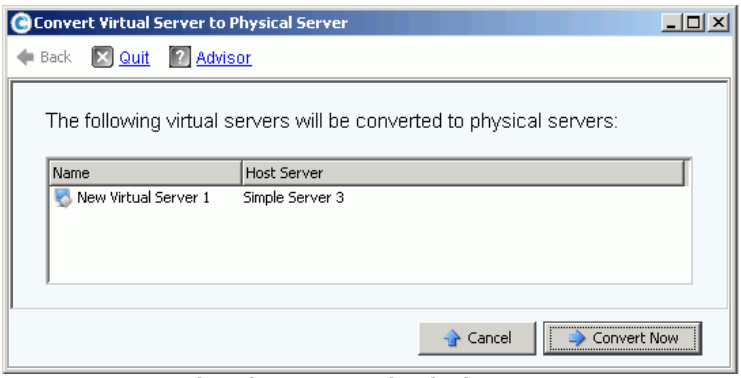


Figure 34. Convert Virtual Server to Physical Server

2 Click **Convert Now**. The other virtual servers remain virtual. Only the server you converted to a physical server is removed from the virtual server group.

Deleting a Virtual Host Server

1 In the system tree, select a virtual host server.

2 From the shortcut menu, select **Delete**. The system warns you that deleting a virtual host server also deletes all virtual servers attached to the host.

3 Click **Yes**. The virtual host server and all virtual servers attached to the host are deleted.

Common Server Commands

Renaming a Server

1 In the system tree, select a server.

2 From the shortcut menu, select **Properties**. The **Server Properties** window appears with the **General** tab selected. This tab shows the server name and operating system.

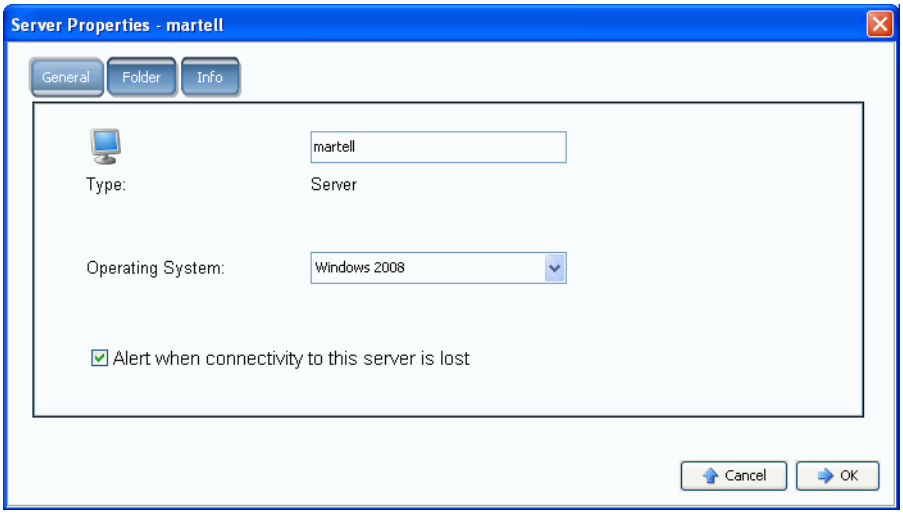


Figure 35. General Server Properties

3 Enter a new name. Enter any notes (up to 255 characters).

4 Click **OK**. The server is renamed.

Changing the Operating System of a Server

If an operating system changes on a server because of an operating system upgrade or an operating system capability changes from single path to multipath, you may need to change the operating system of the server in Storage Center.

To change the operating system of a server

1 In the system tree, select a server.

2 From the shortcut menu, select **Properties**. The **Server Properties** window appears with the **General** tab selected.

3 Select a new operating system. Enter any notes (up to 255 characters).

4 Click **OK**. The operating system of that server is changed.

Displaying Alerts When Server Connection is Lost

You may wish to disable alerts. For example, when you are doing scheduled maintenance, you may not need to be notified that connectivity to a server is lost.

To disable alerts

1. In the system tree, select a server.
2. From the shortcut menu, select **Properties**. The **Server Properties** window with the **General** tab selected appears.
3. Check **Do not show alerts when connectivity to this server is lost**..
4. Click **OK**.

Deleting a Server

Deleting a server returns HBAs connected to that server to the list of available HBAs.

To delete a server

1. In the system tree, select a server.
2. From the shortcut menu, select **Delete**. The system asks you to confirm.
3. Click **Yes**. The server is deleted. Deleting a server cluster deletes all the servers within the cluster. Deleting a server node within a server cluster deletes only that server node. Deleting a server that is part of a virtual server deletes only that server.

Managing HBAs

Adding HBAs to a Server from a List

If you added a new card to a server, you can logically identify it to the Storage Center system.

To add an HBA to a sever

1 In the system tree, select a server.

2 From the shortcut menu, select **Add HBAs to Server**. The **Add HBAs to Server** window appears. In the **Connected Controller Ports** column, the System Manager lists the server ports connected to this controller.

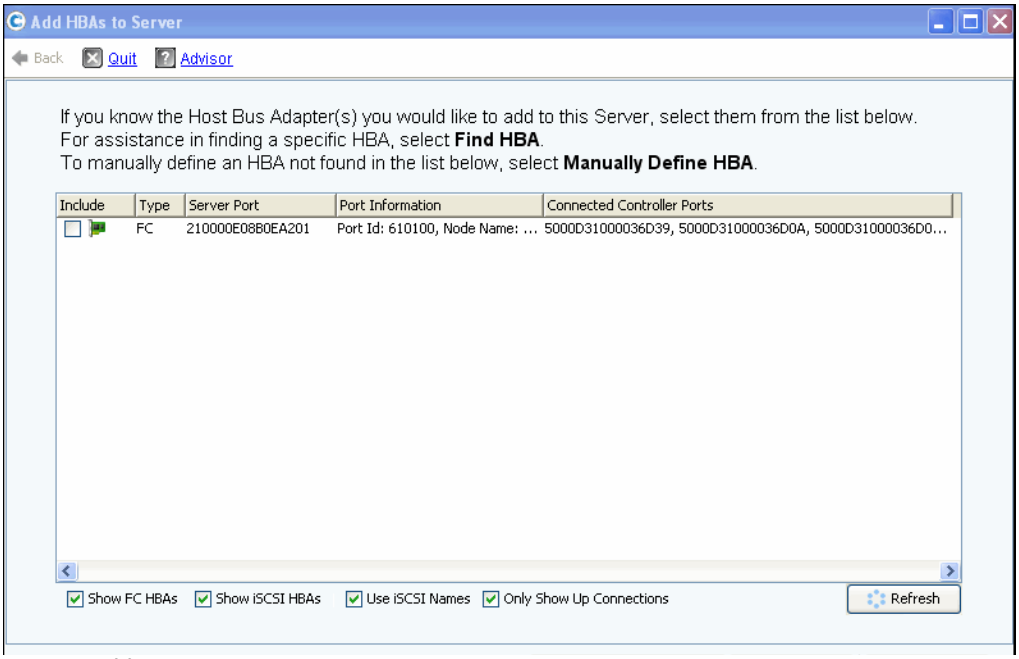

Add HBAs to Server
Back
Quit
Advisor
If you know the Host Bus Adapter(s) you would like to add to this Server, select them from the list below.
For assistance in finding a specific HBA, select Find HBA.
To manually define an HBA not found in the list below, select Manually Define HBA.
Include
Type
Server Port
Port Information
Connected Controller Ports
FC
210000E08B0EA201
Port Id: 610100, Node Name: ...
5000D31000036D39, 5000D31000036D0A, 5000D31000036D0...
Show FC HBAs
Show iSCSI HBAs
Use iSCSI Names
Only Show Up Connections
Refresh

Figure 36. Add HBAs to Servers

3 Choose the HBAs you want to display: FC, iSCSI, or only Up connections.

Note When you click **Refresh**, the System Manager does not scan for new HBAs; it merely re-displays the current list of HBAs.

4 Select an **HBA**.

Note If you select an iSCSI HBA, you have the option to create the server using WWNs or iSCSI Qualified Names (IQNs) for HBAs. Default is iSCSI Name.

5 Click **Continue**. The Storage Center System Manager asks you to confirm.

6 Click **Modify Now**.

Finding an HBA

1 In the system tree, select a server. From the shortcut menu, select **Add HBAs to Server**. The **Add HBAs to Server** window appears.

2 Click **Find HBA**. The system asks if the server is already cabled to the network.

- If you click **Yes**, the system asks you to make sure that the network acknowledges the HBA.

  a Locate and unplug the cable to the HBA on the back of the server.

  b Wait 60 seconds.

  c Plug the cable going to the HBA back into the server.

  d Click Find HBA again.

  e Select an HBA. Click **Continue**. The system asks you to confirm.

- If you click **No**:

  a Plug the server into the FC Network or create a connection by logging on to the iSCSI portal.

  b Wait 30 seconds

  c Click **Continue**.

Note If the system does not see a new HBA, check the cabling and connections. Click **Scan Again**.

Manually Defining an HBA

1 In the system tree, select a server. From the shortcut menu, select **Add HBAs to Server**.

2 In the **Add HBA to Server** window, click **Manually Define HBA**. The Add HBAs to Server window appears.

3 Select a **Transport Type** and enter a World Wide Name or iSCSI name for the HBA.

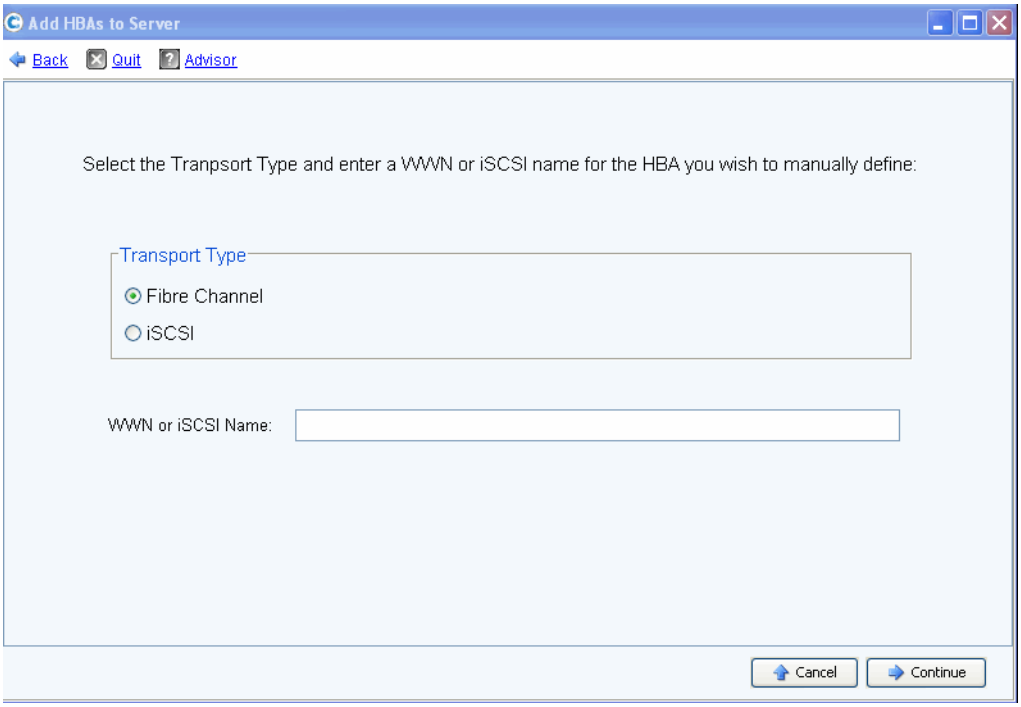


Figure 37. Manually Define HBA

4 Select a transport type: FC or iSCSI.

5 Click **Continue**. The HBA you entered is shown in the list of HBAs.

6 Select the HBA you defined.

7 Click **Continue**. The HBA is added to the server.

Removing HBAs from a Server

Before removing an HBA, make sure that no volumes are mounted to this server through this HBA. If you remove an active HBA, the server that is using the volume no longer has access to that volume and will receive read or write errors. When you map a volume to a server, you are really mapping that volume to one (or possibly more than one) of the server HBAs. When you remove an HBA to which a volume is mapped, the maps are also deleted.

Note Note that when an HBA is removed from a server, any mapping through those HBA ports will be automatically reevaluated and moved to other HBA ports on the server if any are available.

To remove HBAs from a server that does not have volumes mapped to it

1. In the system tree, select a server.
2. From the shortcut menu, select **Remove HBAs from Server**. Storage Center System Manager displays the HBAs on that server.
3. Select an HBA.
4. Click **Continue**. The system asks you to confirm.
5. Click **Remove HBAs Now**. The HBA is removed.

Deleting an HBA

1. In the system tree, select a server.
2. Click on the **HBA** tab.
3. From the shortcut menu, select **Delete**. The Storage Center System Manager asks you to confirm.
4. Click **Yes**.

Remove Mappings from a Server

You can either select a volume and remove the mapping to the server, or select a server and remove volumes mapped to it. This command is similar for servers, server clusters, or virtual servers.

To remove mappings from a server

1. In the system tree, select a server.
2. From the shortcut menu, select **Remove Mappings from a Server**. The system displays volumes mapped to that server.
3. Select mappings to remove.
   - Make sure that the volume mapped to this server is no longer mounted; if you remove an active map entry, the server using the volume will have read/write errors. The system warns you if you are attempting to remove an active map entry.
   - Make sure that removing this mapping will not create a gap in the LUN sequence. Most operating systems require contiguous LUN sequencing starting with LUN 0. A gap in the LUN sequence may cause the server to fail to recognize subsequent volumes.
4. Click **Remove Now**. The mapping is removed.

Managing Server Folders

Creating a Server Folder

You can use server folders to organize servers and to restrict access to servers by some users. Servers folders can be hierarchical. Folders appear in the system tree under the servers node.

To create a server folder

1. In the system tree, select a server.
2. From the shortcut menu, select **Create Server Folder**. The **Create Server Folder** window appears.
3. Enter a name or accept the default.
4. Enter any notes (up to 255 characters).
5. Click **OK**.

Adding Servers to a Server Folder

1. In the system tree, select one or more servers.

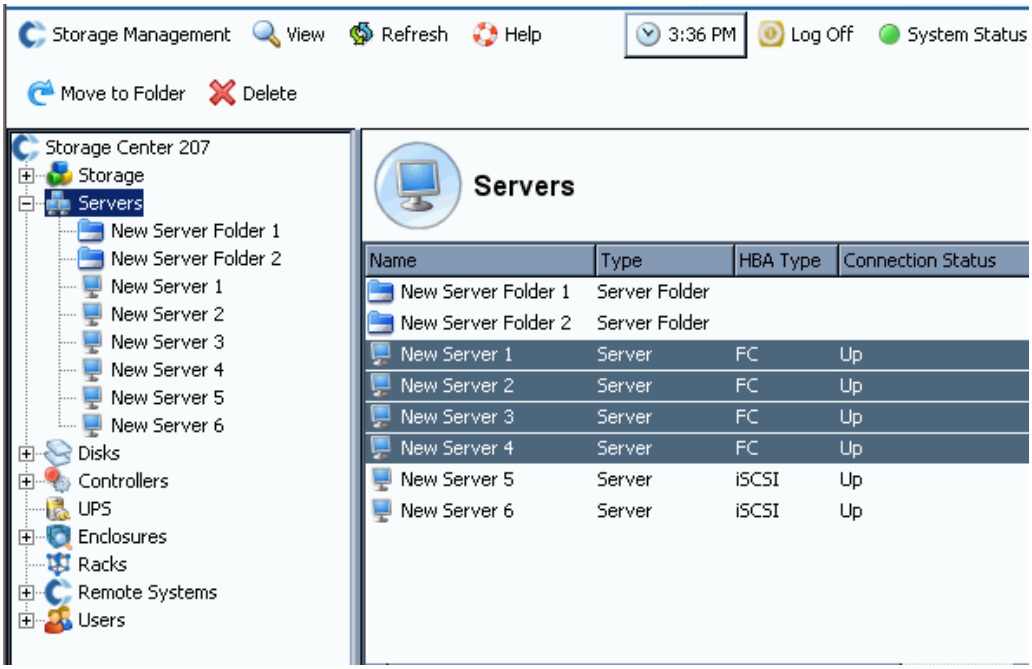


Figure 38. Select Multiple Servers

2. From the shortcut menu, select **Move to Folder**. The Storage Center System Manager displays a list of folders.
3. Select a folder.
4. Click **Continue**. The Storage Center System Manager asks you to confirm.

5 Click **Apply Now**.

Moving Servers to a Different Folder

1 In the system tree, select a server. From the shortcut menu, select **Move to Folder**. The Move Servers window appears, displaying server folders.

2 Select a folder to which to move the server.

3 Click **Continue**. System Manager displays the server and the folder path.

4 Click **Apply Now**.

Viewing Server Information

Viewing Server General Information

1 In the system tree, select the servers node. The main window displays a list of servers or server folders. To view a server within a folder, in the system tree, select a server. The server information window with the **General** tab highlighted appears.

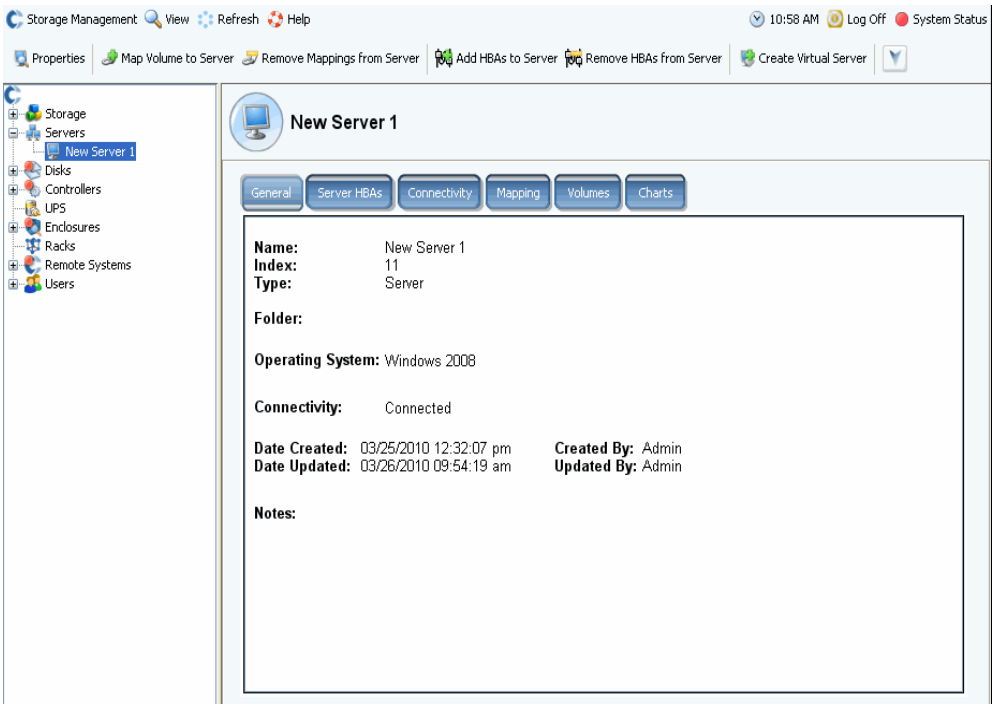


Figure 39. General Server Information

Server information includes:

- **Name:** Applied when server was created. To change the name, refer to Renaming a Server on page 45. Another Storage Center system that is acting as a server to the current system is identified by its Storage Center name. Another Storage Center system acts as a server to the current system if it is replicating data to the current system.
- **Index**: Number used by Dell Support Services to assist with component identification.
- **Folder:** If this Server is organized into a folder, the folder in which it resides.
- **Type:** Server, Virtual Server, or Server Cluster
- **Operating System**: Displays server operating system
- **Connectivity**: Displays connection status of the server.
- **Date**: Displays date created and updated, and by whom.
- **Notes:** if any.

Viewing Server HBAs

Note Server HBAs do not appear in the server cluster window.

1 In the system tree, select a server. The server information window appears with the **Server HBAs** tab highlighted.

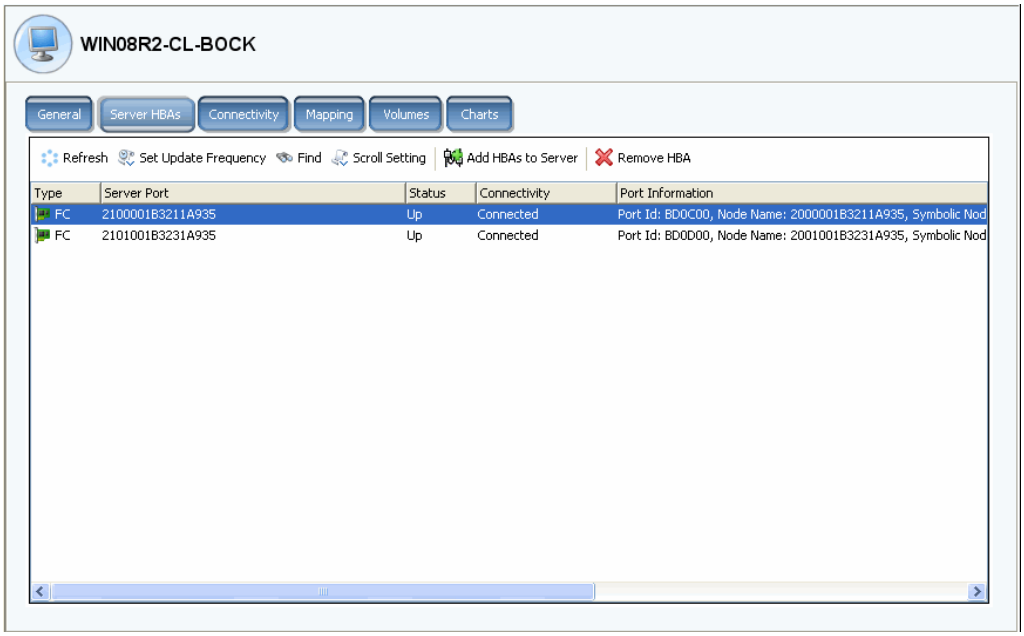


Figure 40. Viewing Server HBAs

2 Click the **Server HBAs** tab. The Server HBAs window appears. The system displays:

- **Type:** FC or iSCSI
- **Server Port**: IQN or WWN for iSCSI, WWN for FC
- **Status:** Up or Down
- **Connectivity**: Displays connection status of the server port.
- **Port information**: Displays **Port ID**, **Node Name**, and other identifying information.
- **Connected controller port ID(s)**

Viewing Server Connectivity

1 In the system tree, select a server.

2 Click the **Connectivity** tab. The ports listed in the Server HBA window are displayed.

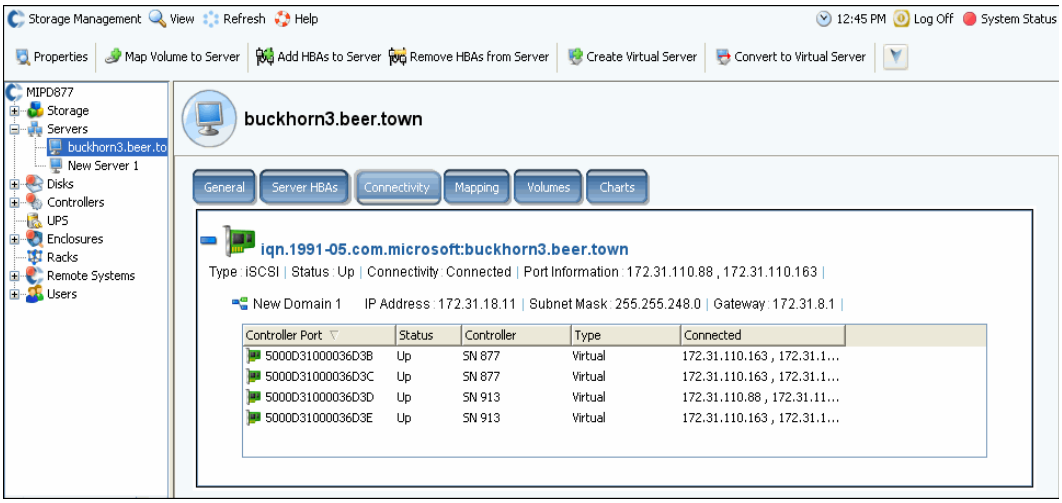


Figure 41. Viewing Server Connectivity

Note The figure above shows a sample connectivity window for iSCSI. For Fibre Channel, this window displays the WWN and there is no IP address, Subnet Mask, or Gateway.

The Connectivity window displays individual HBAs connected to the Storage Center across controller ports and fault domains.

Viewing a Server Connectivity Report

Note Server Connectivity Report appears only if the system does not have Virtual Ports.

1 From the **View** menu, choose **Server Connectivity**. The **Server Connectivity** view appears. The left side of the Server Connectivity window lists:

- WorldWide Name (WWN)
- Name of server
- Type of server
- Port type of FC or iSCSI

2 Scroll to the right to view additional information for each server. For each server, the view displays:

- System to which the server is connected
- Server Port ID
- Fault domain
- Usage: Primary or Reserved
- Server type of FC or iSCSI

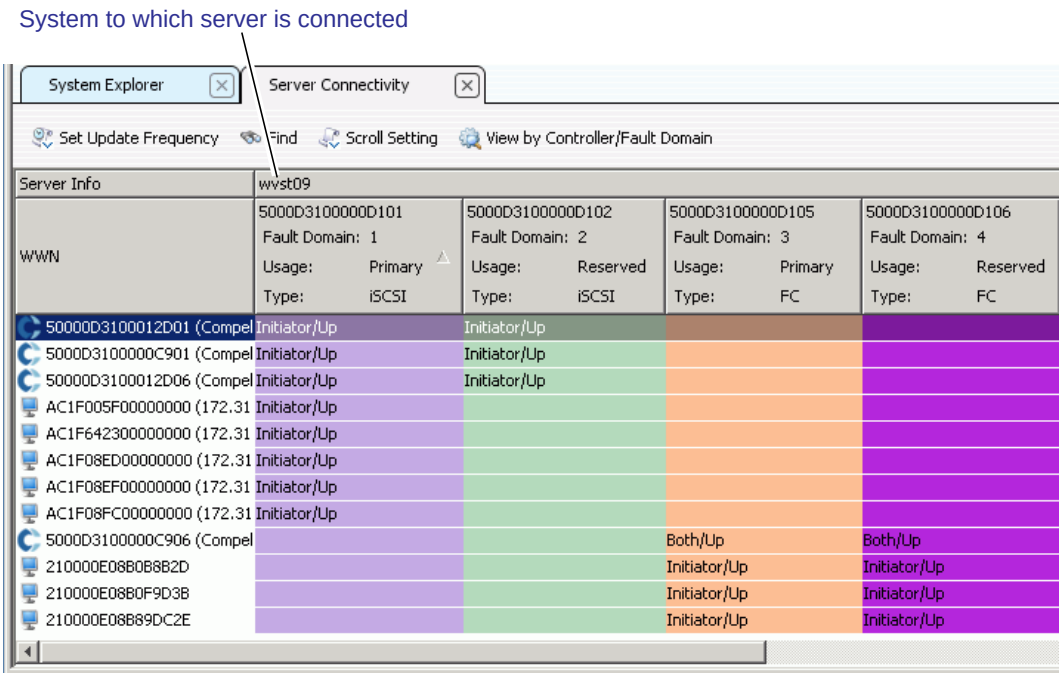


Figure 42. Server Connectivity View

Viewing Server Mapping

1 In the system tree, select a server. The server information window appears in the right frame.

2 Click on the **Mapping** tab. The mapping window appears.

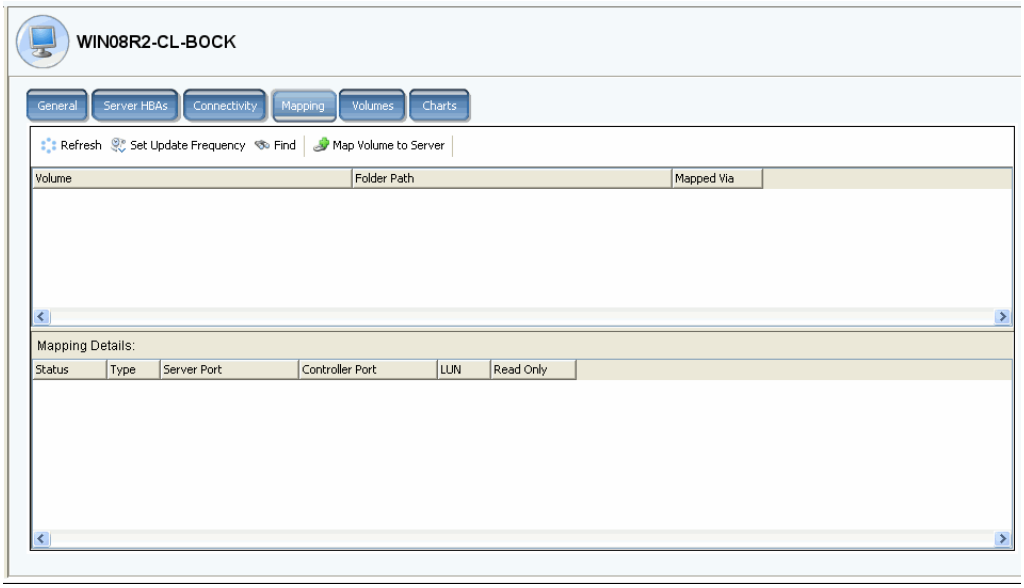


Figure 43. Volumes Mapped to Selected Server

The server mapping tab shows the volumes to which the server is mapped and a mapping detail panel showing additional information about the way in which the volume is mapped to the server.

If the server selected is a virtual server, the virtual server mapping window shows the volumes that are mapped to the virtual server. When a volume is selected, details are displayed. Information includes whether the volume is mapped to the virtual server, the host server of the virtual server, or both.

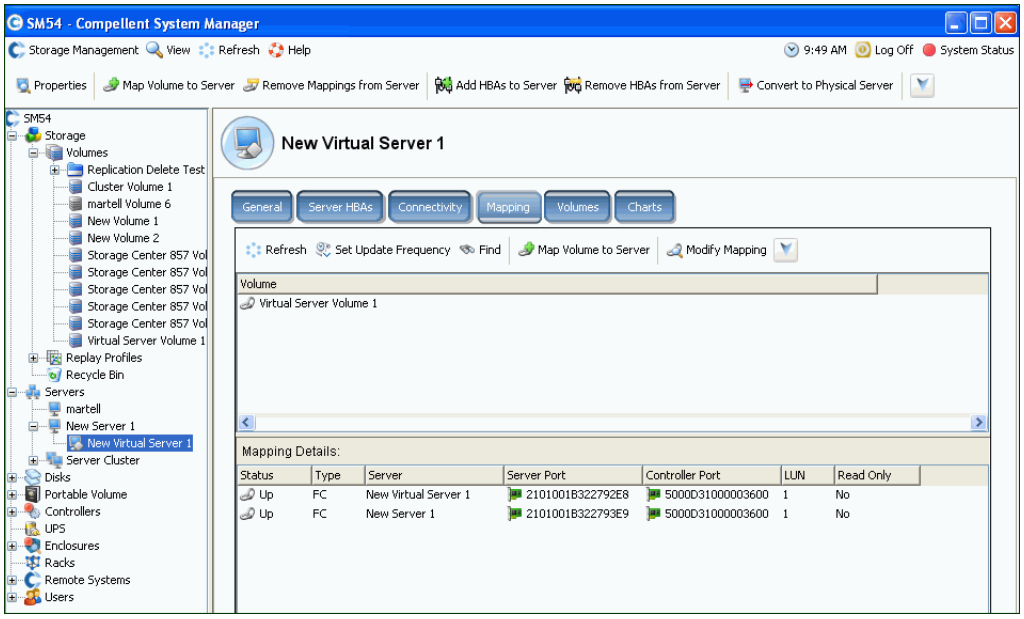


Figure 44. Viewing Virtual Server Mappings

Viewing Advanced Mapping Details

You can view advanced mapping details only if your user volume defaults permit you to. For information on how to enable **Advanced Mapping Details**, refer to User Volume Defaults - Mapping on page 275. If **Advanced Mapping Details** and **Show Advanced Mapping Details** are both enabled, in addition to the mapped volume, volume folder, and server, the Mapping window displays the information described in Advanced Mapping Options on page 74.

Information displayed depends whether the volume is mapped to a:

- Server with HBA ports of different transport types (such as Fibre Channel and iSCSI)
- Server with multiple server HBA ports. Select Specify Server Ports. Select the ports to be used.
- Clustered server
- Virtual server
- If the operating system of the server supports multipathing.

Viewing Volumes Mapped to a Server

1 In the system tree, select a server. The server information window appears.

2 Click the **Volumes** tab. The system displays the volumes that are mapped to this server, including volume name, type of volume, whether the volume is redundant, the amount of disk space consumed by the volume, and the logical size of the volume.

Viewing Volumes Mapped to a Server Cluster

If the servers selected form a server cluster, the mapping window displays the volumes that are mapped to the server cluster. Select a volume to view details about the way that volume is mapped to the server cluster, including cluster node information.

Viewing Volumes Mapped to a Virtual Server

If the servers selected form a virtual server, the mapping window display shows the volumes that are mapped to the virtual server. Select a volume to view details about the way that volume is mapped, including whether the volume is mapped to the virtual server, the host server of the virtual server, or both.

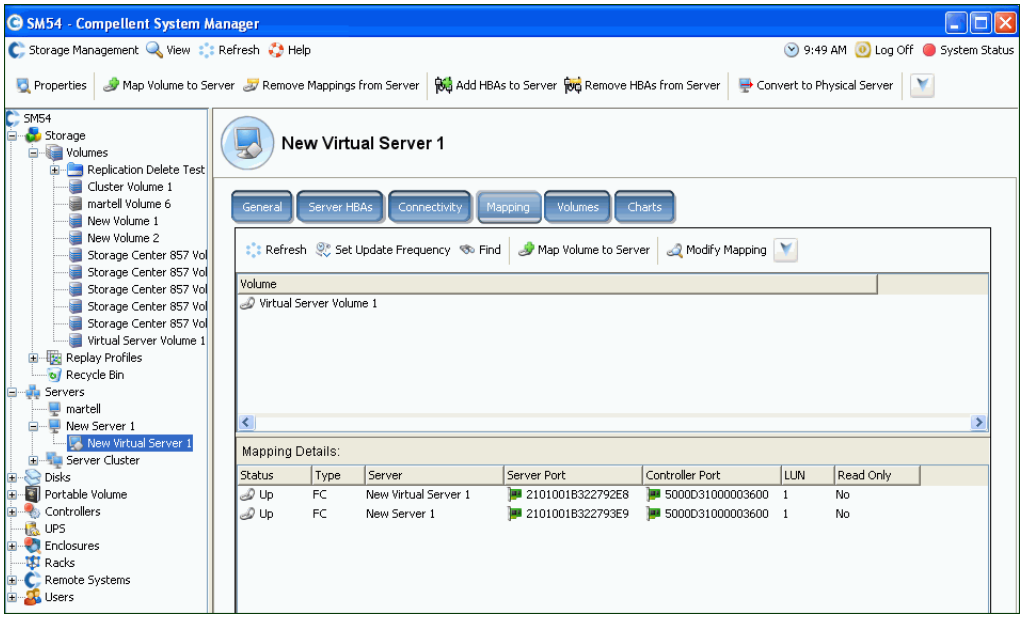


Figure 45. Viewing Volumes Mapped to a Virtual Server

Viewing Volumes Mapped to a Remote System

If the servers selected is a remote system, the **Mapping** window displays the volumes that are mapped to that remote system. Select a volume to view details about the way that volume is mapped to the remote system.

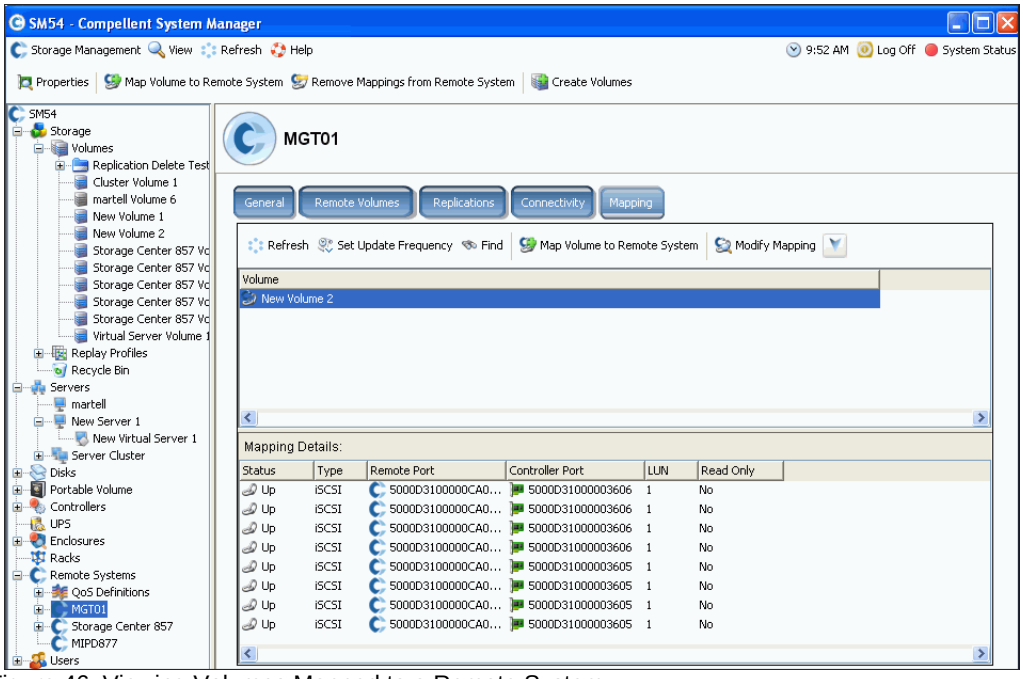


Figure 46. Viewing Volumes Mapped to a Remote System

Server Charts

1 In the system tree, select a server.

2 In the server information window, click on the **Charts** tab.

- The top of the window displays reads, writes, and total KB per second
- The bottom of the window displays reads, writes, and total IO per second

Topology Explorer Server Functions

With **Topology Explorer** you can map volumes to servers and external (remote) systems easily by dragging components. The **Topology Explorer** is divided into three columns. The left column displays servers. The middle column displays volumes, and the right column displays external (remote) systems.

- The **Connections** button, located above the right column, toggles between showing all connections and showing connections only for selected objects. Numbers that appear on the connection lines between servers and volumes indicate the logical unit for the mapping. If there are Replications, there will also be connection lines between volumes and the remote volumes to which they are Replicating.
- The **Folders** button, located to the right of the **Connections** button, toggles between showing and hiding volume folders. When the **Folders** button is toggled to show folders, a red line is drawn through the **Folders** button and unmapped folders are displayed. When the **Topology Explorer** displays folders, two additional command objects appear at the bottom of the window: **Create New Server Folder** and **Create New Volume** Folder.

The following two server functions are available through **Topology Explorer** command objects:

- **Create New Server** object opens the **Create Server** wizard
- **Create New Server Folder** opens the **Create Server Folder** wizard

For information about **Topology Explorer** volume functions, see Topology Explorer Volume Functions on page 109.

To open the Topology Explorer

From the **View** menu, select **Topology Explorer**.

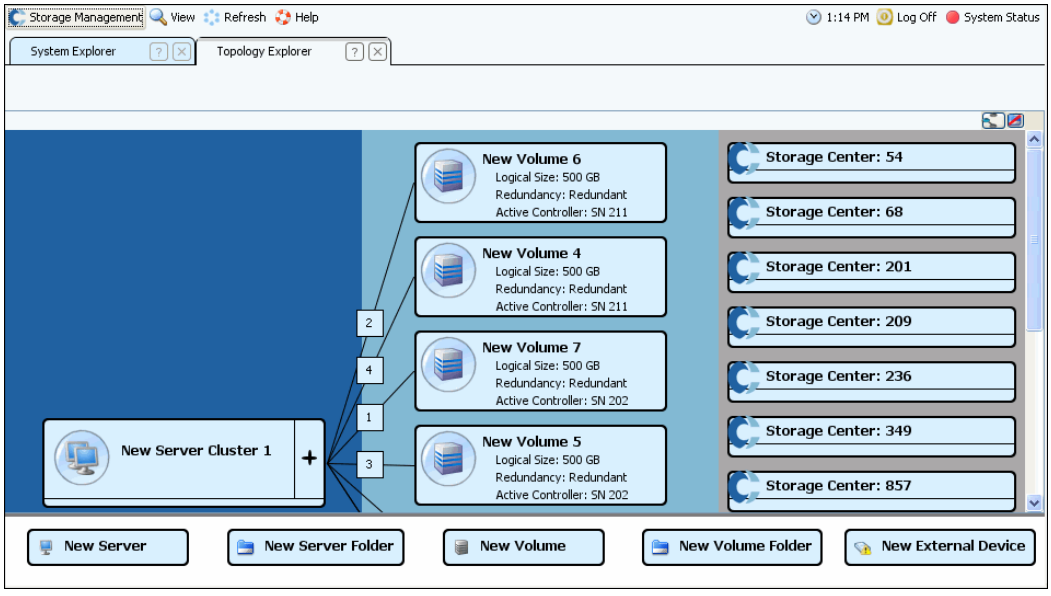


Figure 47. Topology Explorer

Creating a New Server with the Topology Explorer

1 Drag the **New Server** command object to the **Topology Explorer** window. The **Create Server** wizard appears.

2 Follow the instructions described in Creating a Server on page 29.

Creating a New Server Folder with the Topology Explorer

1 Make sure the **Show Folders** toggle is enabled and the **Show Folder** command object appears.

2 Drag the **New Server Folder** command object to the **Topology Explorer** window. The **Create New Server Folder** wizard appears.

3 Follow the instructions described in Creating a Server Folder on page 52.

4 Volumes

Introduction 66
Creating Volumes 67
Mapping Volumes to a Server 73
Creating a Boot from SAN Volume 82
Viewing Volume Information 100
Modifying Volumes 86
Managing Volume Folders 91
Applying Replay Profiles 95
Copy, Mirror, and Migrate 97
Recycle Bin 108
Topology Explorer Volume Functions 109

Introduction

This chapter describes creating and managing volumes. Volumes can be created only from an assigned folder of managed disks.

A volume is a logical storage repository. You can allocate more logical space to a volume than is physically available on the Storage Center.

Because user access to a volume is controlled by user groups and associated volume folders and volumes, group volumes into folders based on the way you want to control user access. You can then create a corresponding user group and grant access to that volume folder or volume. (Refer to Users and Groups on page 261.)

Types of Volumes

A volume is a single accessible storage area with a single file system. It is the same as a logical drive. Via RAID, a Storage Center volume is physically located on some or all of the drives within a Disk Folder. In a Microsoft Operating system, a volume can be assigned a drive letter; in UNIX, a volume is assigned a mount point. A volume can be one of the following:

- **Standard Volumes** are described in this chapter.
- **Portable Volumes and Remote Volumes** are described in Remote Instant Replay on page 327.

Creating Volumes

Creating a Volume

Volumes are configured through the Configure Volume Defaults window. If some Create Volume options do not appear, defaults were configured to disallow these choices. For more information about User Volume Defaults, refer to Configuring User Volume Defaults on page 272.

To create a volume with the Create Volume wizard

1 From the Storage Management window, select **Create > Volume**.

2 The Create Volume wizard asks you to enter a volume size.

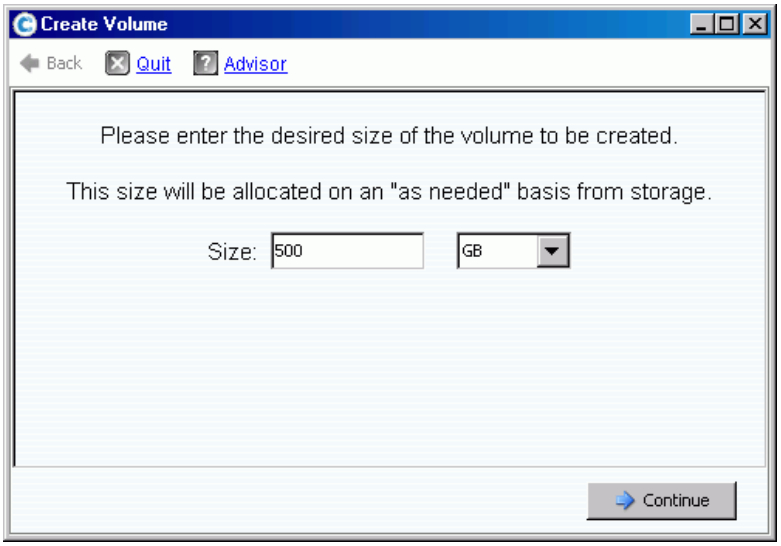


Figure 48. Create Volume Window

3 Enter a volume size in GB, TB, or PB. The maximum size of a volume is 10 PB.

Note If your User Volume Defaults allow you to modify cache settings or Storage Profiles, an Advanced button appears.

- For more information about Cache settings, refer to To change volume cache properties on page 88.
- For more information about Storage Profiles, refer to Storage Profiles on page 381.

4 Click **Continue**.

If Data Instant Replay is licensed for your system, the Replay Profile window appears.

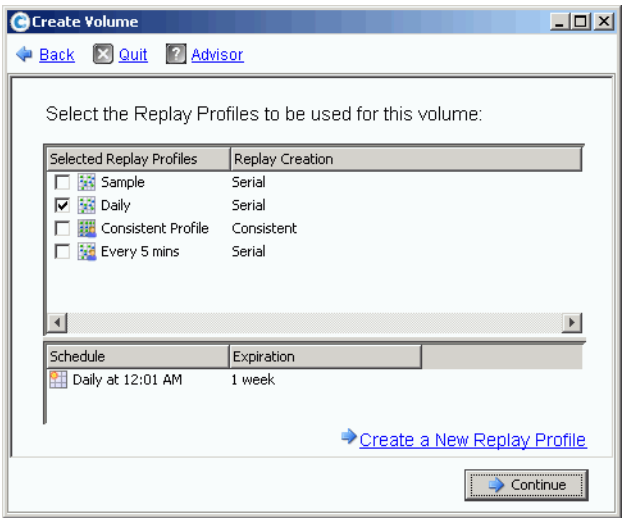


Figure 49. Select Replay Profile

5 Select an existing Replay Profile, or click **Create a New Replay Profile**. For more information about creating Replay profiles, refer to Creating Replay Profiles on page 292.

6 Click **Continue**. The window on which you can select or create a folder and name the volume appears.

7 Select a folder in which to create the volume or create a new folder.

8 Enter a volume name or accept the default.

9 Click **Continue**. The system displays the attributes of the volume.

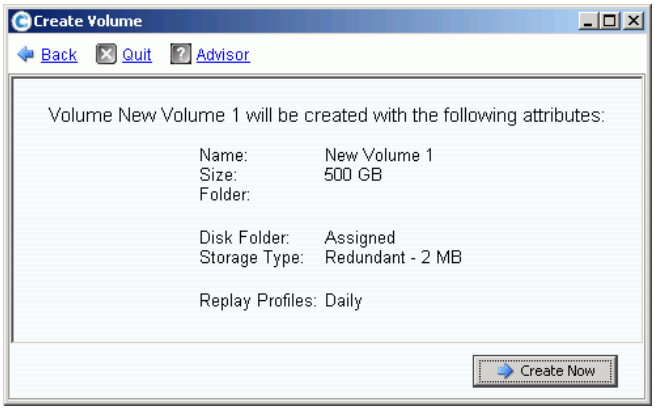


Figure 50. Volume Attributes

10 Review the attributes. The attributes depend on the options available to you when creating volumes. Click **Create Now**.

Note Volumes are automatically mapped to the last server you selected.

Next Action Window

This next window presents options that are available after creating a volume.

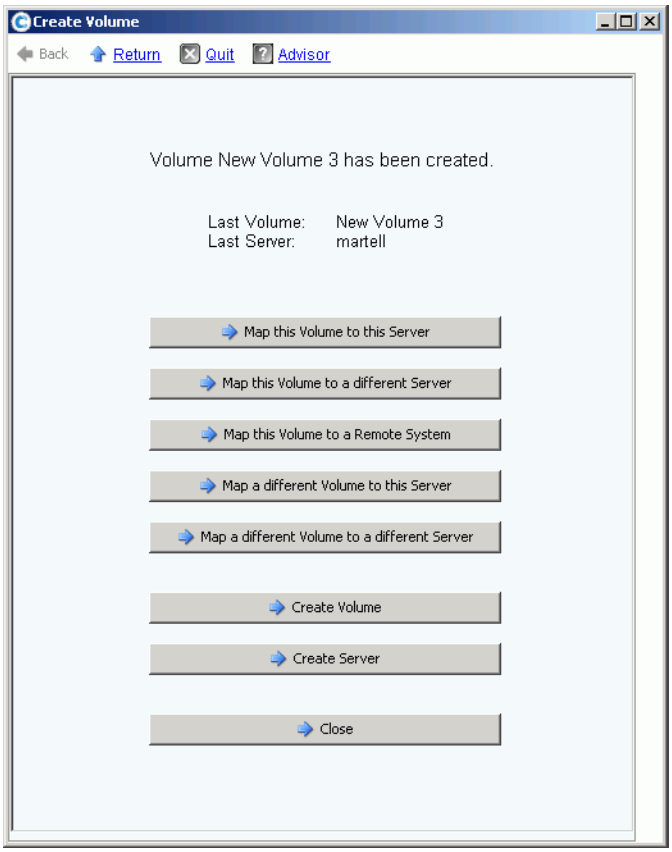


Figure 51. Next Action Window

Depending on your configuration, some or all of the following commands may appear in this window:

- **Map this Volume to this Server**
- **Map this Volume to a Different Server**
- **Map this Volume to a Remote System**
- **Map a different Volume to this Server**
- **Map a different Volume to a different Server**
- **Create a Volume**
- **Create a Server**
- **Close this window**

Creating Multiple Volumes for a Server

The Create Volumes wizard creates multiple volumes and maps them to a server in a single operation.

Note Adding a volume to the volume list in the Create Volumes for Server wizard does not cause the volume to be created. Volumes are only created when you select **Create Volumes Now**.

To create volumes for a server

1 In the system tree, select a server, server cluster, or virtual server.

2 From the shortcut menu, select **Create Volumes**. The Create Volume window appears. By default, the name of the volume is based on the name of the server.

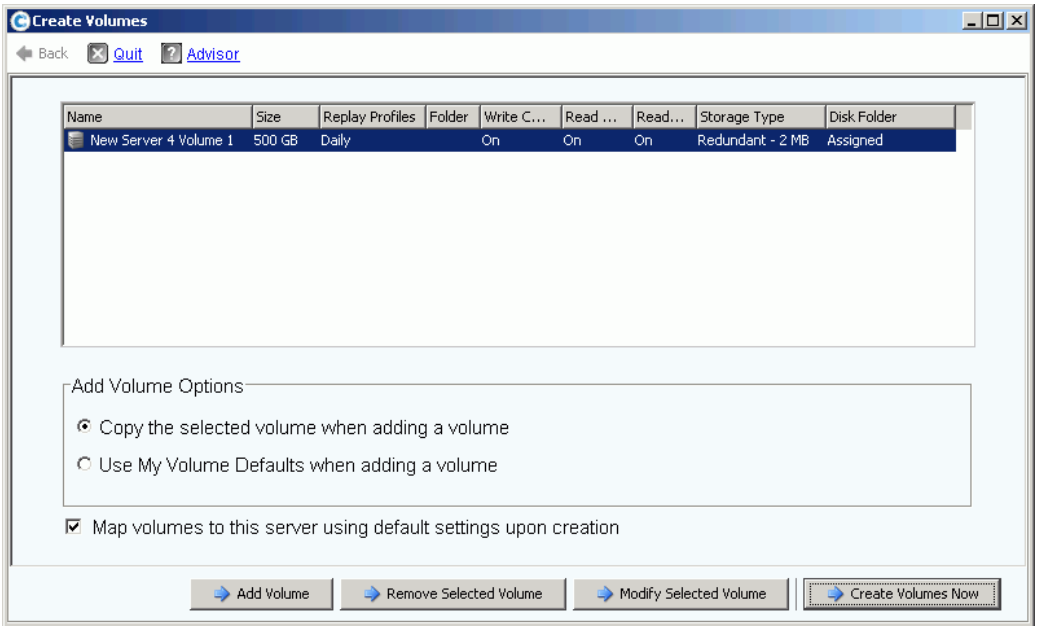


Figure 52. Create Volumes from Server

3 Review Add Volume options:

- **Copy the selected volume when adding a volume**: The added volume copies all attributes except name from the volume currently selected in the volume list.
- **Use My Volume Defaults when adding a volume**: The added volume uses your user volume defaults for creating a volume. Refer to Configuring User Volume Defaults on page 272.
- **Map Volumes to this server using default settings upon creation**: Checking this automatically maps volumes to this server after they are created using default mapping options. If there are special considerations for mapping volumes to this server, uncheck Map Volumes to this server using default settings and manually map the volumes to the server later.

4 Choose from the following:

- To add an additional volume to be created, click **Add Volume**. Adding a volume to the volume list does not cause the volume to be created. Volumes are only created when you click **Create Volumes Now.**
- Continue to click the **Add Volume** button to add and map multiple volumes.
- To remove the volume currently selected in the volume list, click **Remove Selected Volume**.
- To modify the volume currently selected in the volume list, click **Modify Selected Volume**. If you are creating multiple volumes, modify the first volume in the list and make sure the **Copy the selected volume when adding a volume** box is checked.
- To create volumes, click **Create Volumes Now** . If the Map Volumes to this server using default settings upon creation checkbox is selected, the volumes will be automatically mapped to the selected server after they are created

Creating Multiple Volumes

Create volume options are configured through the Configure Volume Defaults window. If some Create Volume options do not appear, defaults were configured to disallow these choices. For more information about User Volume Defaults, refer to Configuring User Volume Defaults on page 272.

Note If you intend to add multiple volumes with similar attributes, you should modify the first volume in the list, then copy the attributes from this volume when adding additional volumes.

To create multiple volumes

1 In the Storage Tree, select **Storage** or **Volumes,** from the shortcut menu, select **Create Volumes**. The Create Volumes window appears.

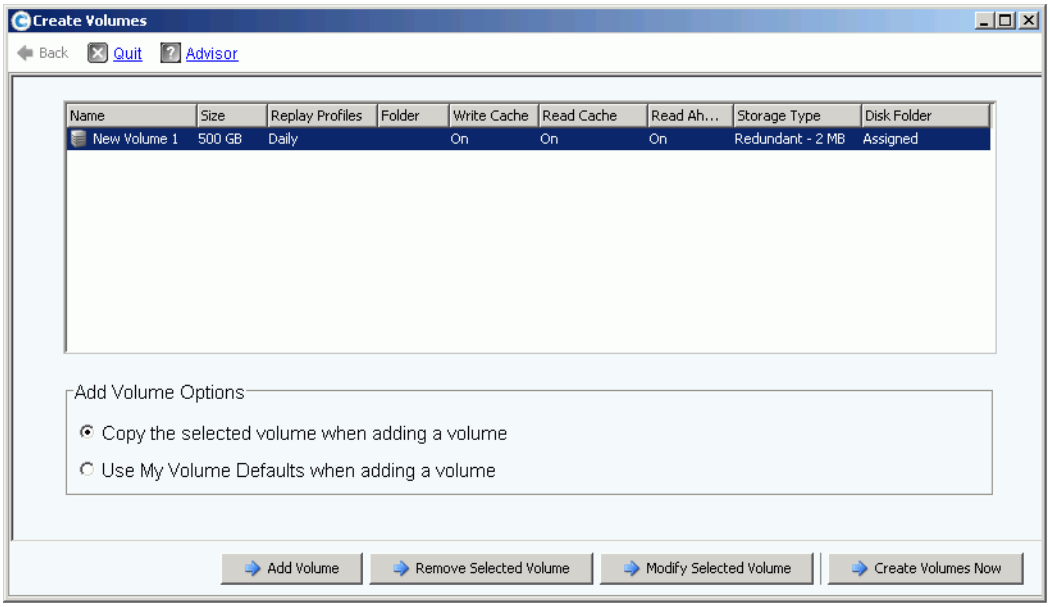


Figure 53. Create Multiple Volume Window

2 Choose a Volume Option:

- Select **Copy selected volume when adding a volume** to copy all volume attributes except name from the volume currently selected in the volume list. The name is incremented by one number: Volume 1, Volume 2, etc.
- Select **Use My Volume Defaults when adding a volume** to use your Volume Defaults.

3 Select **Add Volume** to add additional volumes. (Volumes are not created until you click **Create Volumes Now**.) Volumes are added to the list of volumes to create.

4 Select **Remove Selected Volume** to remove the volume currently selected in the volume list.

5 Select **Modify Selected Volume** to modify the volume currently selected in the volume list. The Modify Volume window appears.

Depending upon the user preferences you have selected, you may not be allowed to change certain attributes. To change your user preferences, select the root of the System Explorer tree and select Configure My Volume Defaults. Possible modifications include:

- Name
- Size
- Folder in which volume resides, or create a new folder
- Replay Profile, or create a new Replay Profile
- Storage Profile
- Disk folder to select the disk folder for the volume to use. The disk folder contains the physical disks the volume will use for storage.

6 Select **Apply Changes** to make the modification(s) and return to the volume list.

Mapping Volumes to a Server

Mapping enables servers to connect to volumes.

Mapping a Volume to a Server

1 In the system tree, select an unmapped volume. Expand the Storage Node if necessary.

2 From the shortcut menu, select **Map Volume to Server**. A list of servers is displayed.

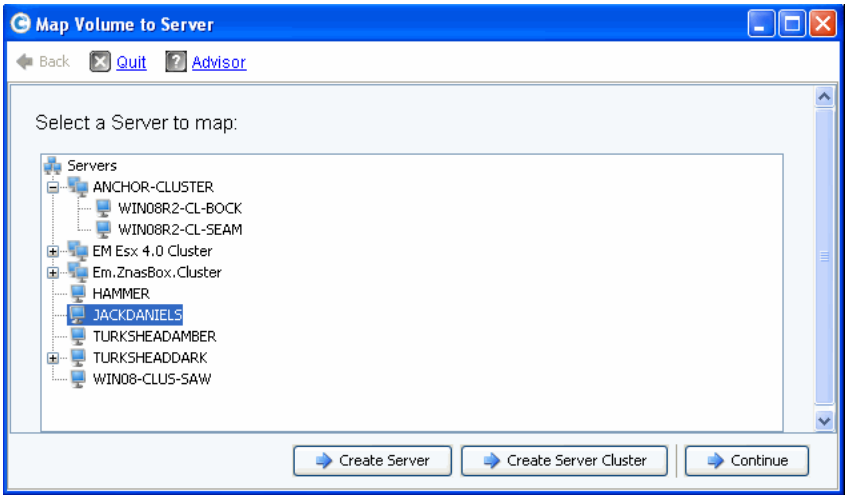


Figure 54. Map Volume to Server – Server List

3 Select a server to map to the selected volume(s).

4 Click **Continue**.

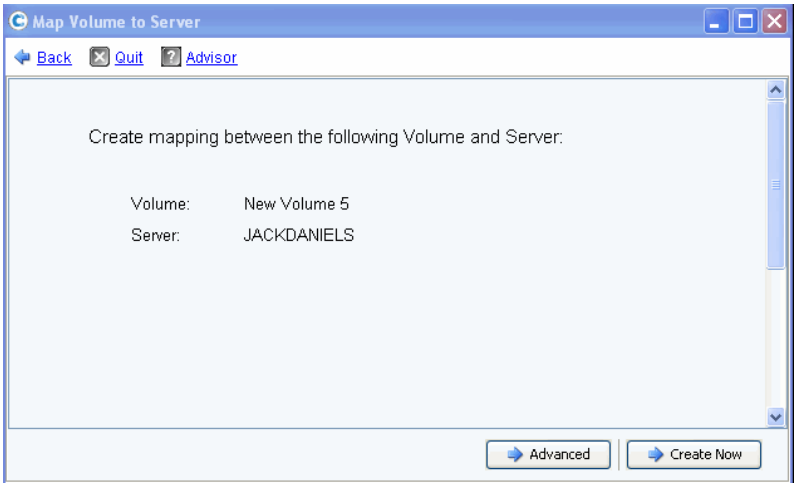


Figure 55. Map Volume to Server Confirmation

5 Click **Create Now**. The volume is mapped.

Advanced Mapping Options

To view advanced options, you must map volumes individually. If you map multiple volumes, the advanced window does not appear. Make sure that **Allow Advanced Mapping** is enabled in your User Volume Mapping Defaults. Refer to User Volume Defaults - Mapping on page 275.

Note The advanced options available differ depending upon the configuration of the server and the configuration of the Storage Center.

In the Map Volume to Server Confirmation window, click **Advanced**. The Advanced Map Volume to Server window appears.

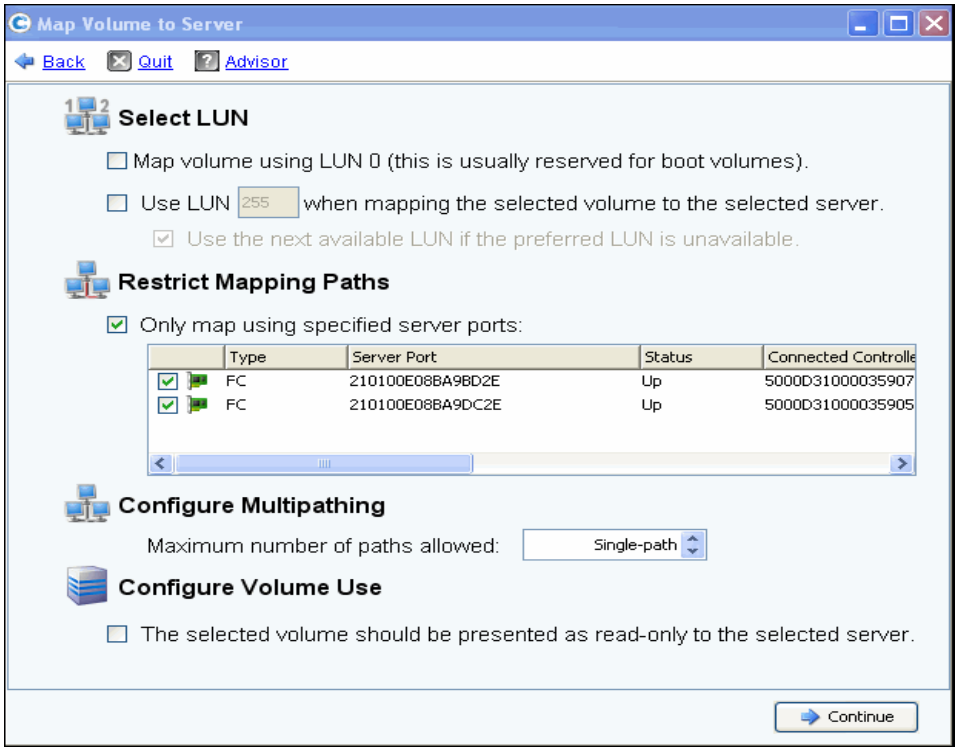


Figure 56. Advance Mapping Options

The options available on the Advanced mapping screen will differ depending upon the configuration of your system. For the volume you are mapping, choose from the following options:

Selecting a Logical Unit Number

- If the volume you are mapping is a boot volume, select **Map Volume using LUN 0**. LUN 0 is reserved for boot volumes. If the volume you are mapping is not a boot volume, make sure this option is cleared. If a volume has already been mapped to the selected server using LUN 0, this option does not appear.
- To map the selected volume to the server using a specific LUN, select and enter a LUN.

- By default, Storage Center uses a different LUN if the specified LUN is already in use. To use the next available LUN, check **Use Next Available LUN**. If you do not want to use a different LUN when the specified LUN is already in use, clear the **Use Next Available LUN** checkbox.

Restricting Mapping Paths

These options will only appear when mapping to a server with multiple server HBA ports, when mapping a server on a cluster Storage Center, or when mapping a virtual server to a volume.

The options that appear depends on the type of server to which you are mapping this volume:

- Server with HBA ports of different transport types (such as Fibre Channel and iSCSI): **Select Transport** option appears. Check to map to only one of the transport types. Select the transport type.
- Server with multiple server HBA ports: Select **Specify Server Ports**. Select the ports to be used.
- Map to Controller: To map to a specific controller, check **Map to Controller.** Select a controller.
- Map to host: **Select Host, Virtual, or Both**.

Configuring Multipathing

If the operating system of a server does not support multipathing, this option will not be shown.

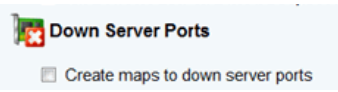
- Select the maximum number of paths used to map the selected volume to the server. The maximum number of paths allowed may be limited by the operating system of the server.

Creating a Read-Only Volume

Under **Configure Volume Use**, check to present this volume as read-only.

Creating Mapping to Down Server Ports

This is an informational message that appears only if the selected server has down ports:



Enabling mapping to Down Server Ports

Check the box to enable mapping to down server ports.

Mapping Multiple Volumes to a Server or Server Cluster

To create multiple volumes automatically mapped to a server, refer to Creating Multiple Volumes for a Server on page 70.

To map multiple volumes to a server

1 In the system tree, select a storage folder or the Volumes node. The volumes in that folder appear in the main window.

2 Select a volume or, using the **Ctrl** key, select more than one volume.

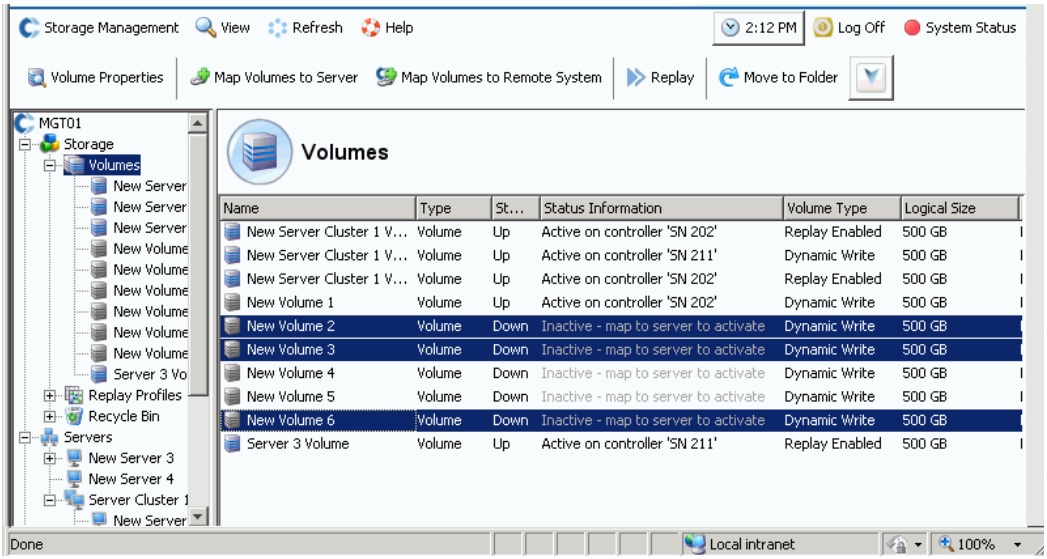

Storage Management
View
Refresh
Help
2:12 PM
Log Off
System Status
Volume Properties
Map Volumes to Server
Map Volumes to Remote System
Replay
Move to Folder
MGT01
Storage
Volumes
Replay Profiles
Recycle Bin
Servers
New Server 3
New Server 4
Server Cluster 1
Volumes
Name
Type
St...
Status Information
Volume Type
Logical Size
New Server Cluster 1 V... Volume Up Active on controller 'SN 202' Replay Enabled 500 GB
New Server Cluster 1 V... Volume Up Active on controller 'SN 211' Dynamic Write 500 GB
New Server Cluster 1 V... Volume Up Active on controller 'SN 202' Replay Enabled 500 GB
New Volume 1 Volume Up Active on controller 'SN 202' Dynamic Write 500 GB
New Volume 2 Volume Down Inactive - map to server to activate Dynamic Write 500 GB
New Volume 3 Volume Down Inactive - map to server to activate Dynamic Write 500 GB
New Volume 4 Volume Down Inactive - map to server to activate Dynamic Write 500 GB
New Volume 5 Volume Down Inactive - map to server to activate Dynamic Write 500 GB
New Volume 6 Volume Down Inactive - map to server to activate Dynamic Write 500 GB
Server 3 Volume Volume Up Active on controller 'SN 211' Replay Enabled 500 GB
Done
Local intranet
100%

Figure 57. Select Volumes to Map

3 From the shortcut menu, select **Map Volumes to Server**. A list of servers appears. By default, the last server that you selected is selected as the server to map to.

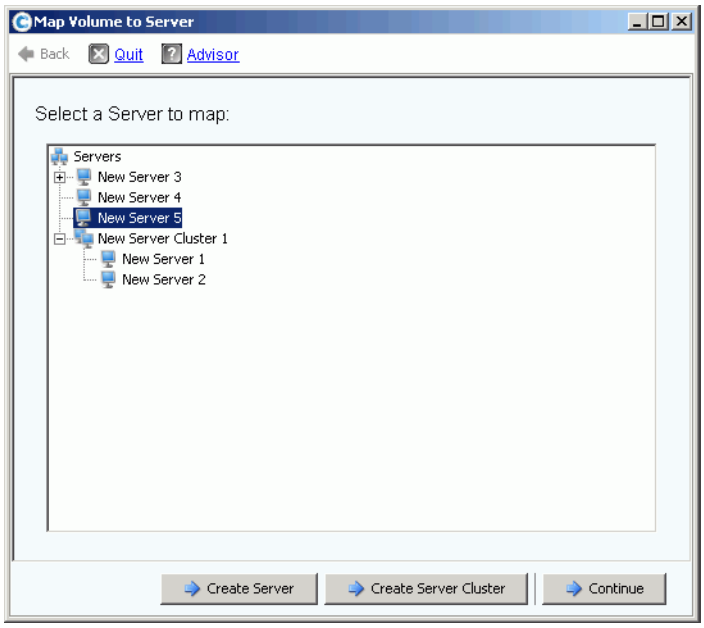


Figure 58. Select Server for Volume Mapping

4 From here, you can:

- Accept the selected server or server cluster
- Choose a different server or server cluster
- Create a server or server cluster to map the volumes to

5 Select **Continue**. The system asks you to confirm.

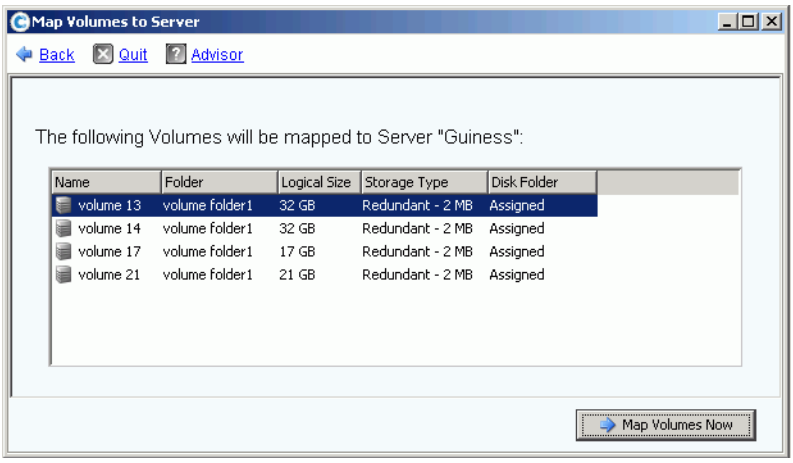


Figure 59. Confirm Mapping Multiple Volumes

6 Click **Map Volumes Now**. The volumes are mapped to a single server. An exception to this is if the server is part of a server cluster. Refer to Server Clusters on page 32.

When creating a server cluster, Storage Center attempts to map an included volume to the same LUN on all cluster servers. If the LUN selected is not available on a particular server, the mapping is not performed and the volume is only partially connected to the cluster.

Mapping a Volume to Remote System

Mapping a volume to a remote system causes the volume to appear as a remote volume on the remote system. The volume can then be used as a replication target.

To map a volume to a remote system

1. In the system tree, select an unmapped volume.
2. From the shortcut menu, select **Map Volume to Remote System**. A list of remote systems appears.
3. Select a remote system.
   a. Optional: Click **Advanced** to restrict mapping paths.

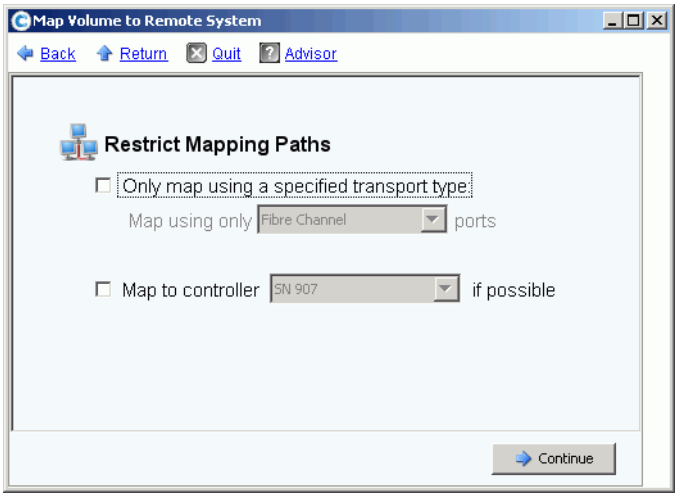


Figure 60. Map Volume to Remote System Advanced

   b. Restrict the path to one transport, such as FC or iSCSI.
   c. In a clustered-controller system, select a controller to which to map the volume.
   d. Click **Continue**.
4. The system asks you to confirm. Click **Create Now**.

Removing Mapping from a Volume

1. In the system tree, select a volume.
2. From the shortcut menu, select **Remove Mappings from Volume**. The Remove Mappings from Volume window appears.
3. Select the mapping(s) to remove.
4. Click **Continue**. The mappings confirmation window is displayed.
5. Click **Remove Mappings Now**. If a mapping is still active, System Manager asks you to confirm. Before removing the mapping, confirm that the volume is no longer in use by the server. If you remove a mapping to a volume which is in use, the server will no longer have access to the volume and will have read/write errors.

Import Data to Lowest Tier

Use **Import Data to Lowest Tier** to write large amounts of data to the lowest tier of storage configured for a volume. This is useful when performing an OS-level copy of a data to a Storage Center volume from a server-attached data source.

To import data to the lowest tier

1. From the system tree, select a target volume.
2. From the shortcut menu, select **Properties**. The Volume Properties window appears.

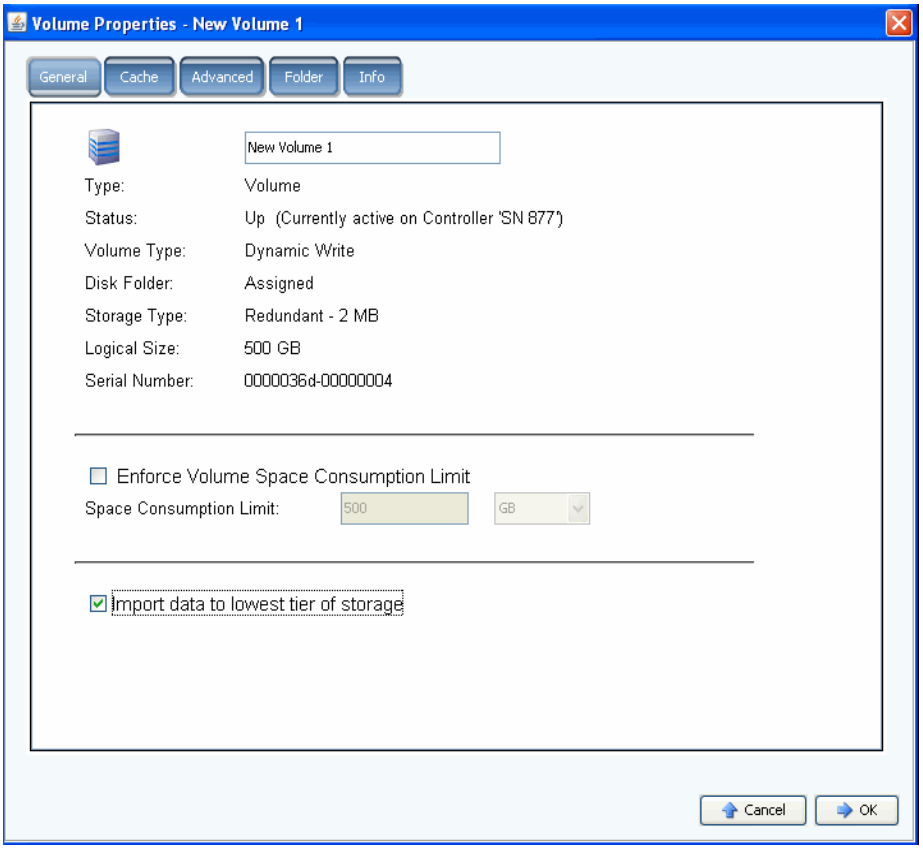


Figure 61. Import Data to Lowest Tier

3. Select or clear **Import data to lowest tier of storage**. If selected, data is written to the lowest tier of storage available based upon the configuration of the storage profile of the volume. No Replays are taken for the volume during data import. If this option is unchecked, by default data is written to the highest tier of storage configured for the volume.

Note Import mode is not allowed for volumes that are mapped to another Storage Center system for use as replication destinations. The Import data to lowest tier of storage option is not displayed on the Volume Properties screen. Importing data is managed in Enterprise Manager as part of the replication to that volume. For more information, refer to the *Enterprise Manager User Guide*.

In the System Explorer, a volume that is set for importing data to the lowest tier appears with a yellow warning icon and a message that data is being imported to the lowest tier.

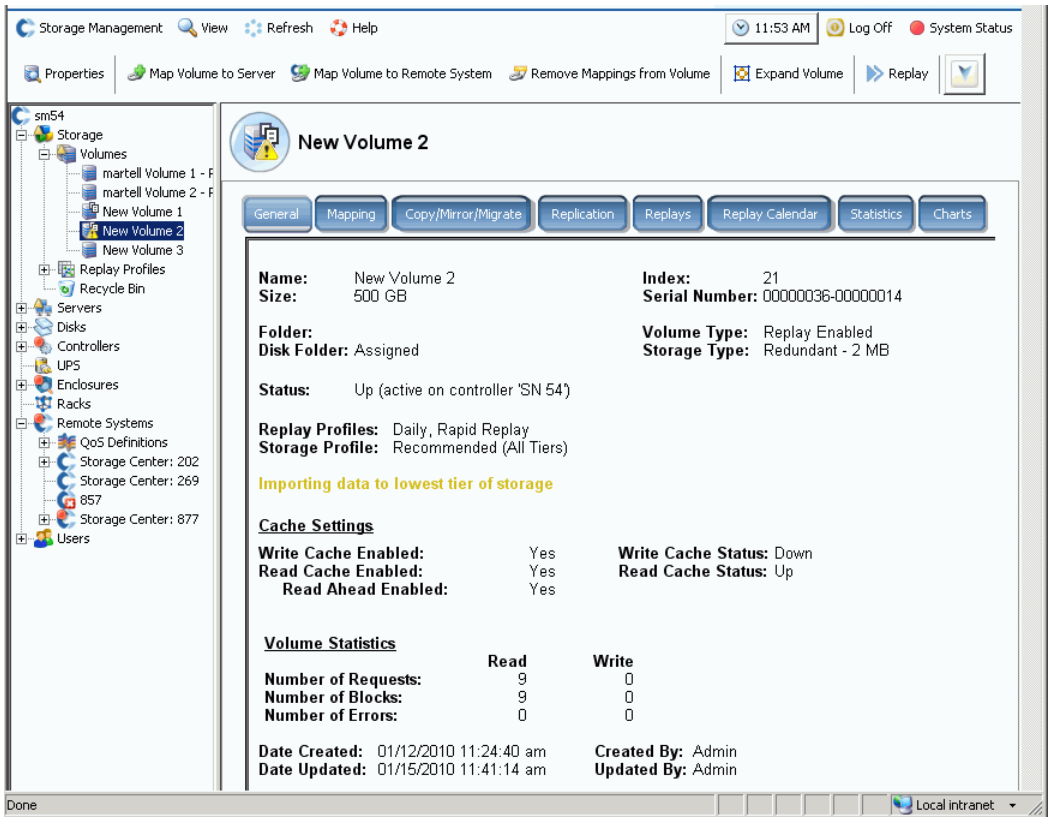


Figure 62. Volume in Lowest Tier Import Mode

While a volume is in import mode, replays are not taken for that volume. Replays are resumed when the volume is taken out of import mode.

Once the data is imported, it is your responsibility to take the volume out of Import mode.

Taking a Volume Out of Import Mode

1. Select a volume that has been placed into import mode. From the shortcut menu, select Properties. The Properties window appears.
2. Uncheck **Import Data to Lowest Tier of Storage**.
3. Click **OK**. The volume is no longer in import mode.

Creating a Boot from SAN Volume

Boot from SAN dramatically reduces the time to recover servers by creating and storing Replays of the boot volume at the disaster recovery site. The Boot from SAN function allows servers to use an external SAN volume as the boot volume for the server. In the event of a failure, power up a spare server, point the server to a boot image on the SAN, and boot the server up.

Note To use the Boot from SAN wizard, you must already have a boot from SAN volume created and in use. A boot from SAN volume is operating system-dependent and requires the server HBA to be specifically configured and enabled to boot from the SAN. See your respective operating system and HBA provider to create this configuration.

To create a boot from SAN copy

1 From the Storage Management menu, choose **Volume > Create a Boot from SAN** Volume. The Boot from SAN wizard opens.

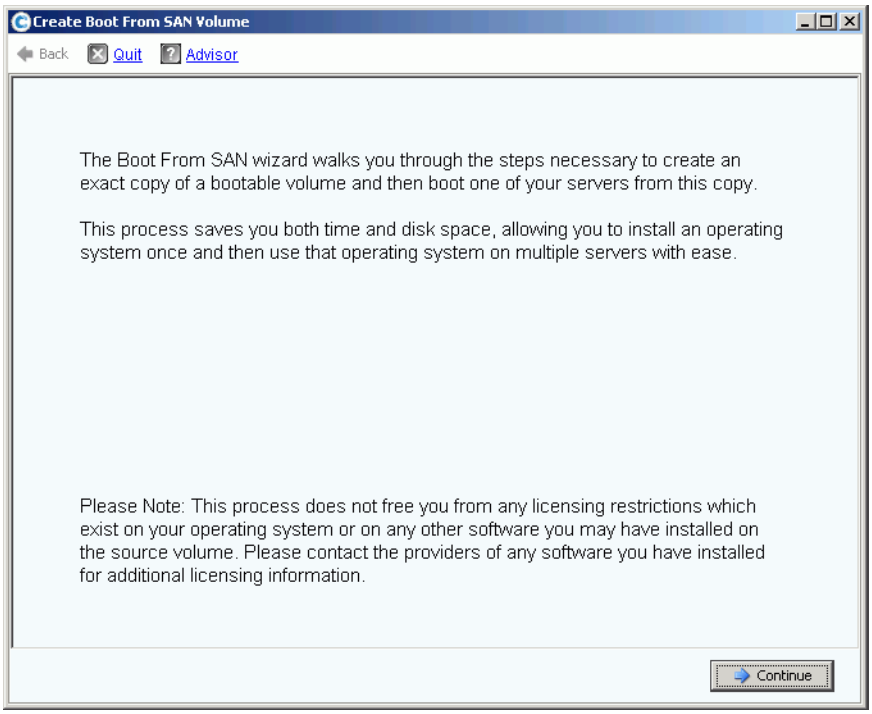

Create Boot From SAN Volume
Back
Quit
Advisor
The Boot From SAN wizard walks you through the steps necessary to create an exact copy of a bootable volume and then boot one of your servers from this copy.
This process saves you both time and disk space, allowing you to install an operating system once and then use that operating system on multiple servers with ease.
Please Note: This process does not free you from any licensing restrictions which exist on your operating system or on any other software you may have installed on the source volume. Please contact the providers of any software you have installed for additional licensing information.
Continue

Figure 63. Boot from SAN Wizard

2 Click **Continue**. The Create Boot from SAN Volume window appears.

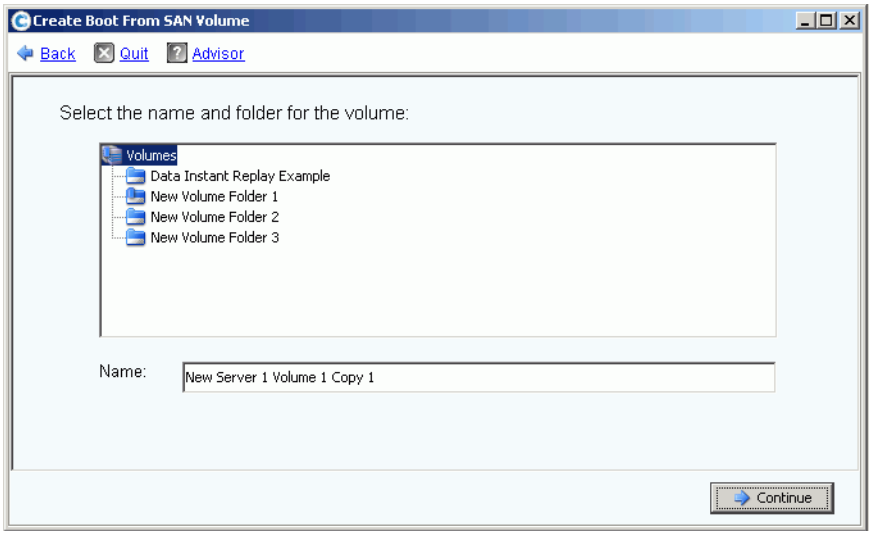


Figure 64. Boot Volume Name and Folder

3 Select a name and folder or accept the default. Click **Continue**. The Replay window appears.

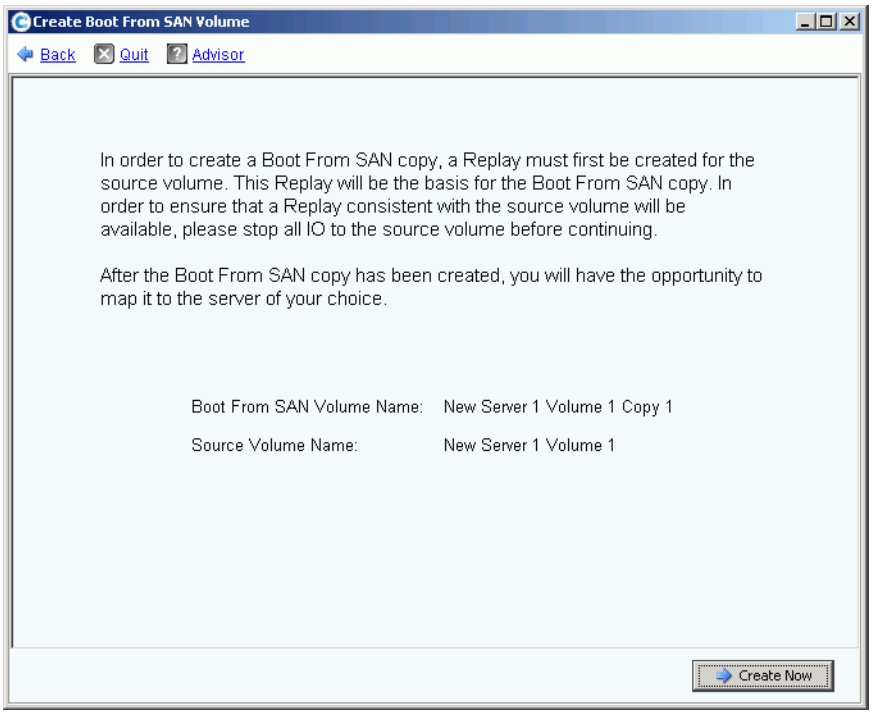

Create Boot From SAN Volume
Back
Quit
Advisor
In order to create a Boot From SAN copy, a Replay must first be created for the source volume. This Replay will be the basis for the Boot From SAN copy. In order to ensure that a Replay consistent with the source volume will be available, please stop all IO to the source volume before continuing.
After the Boot From SAN copy has been created, you will have the opportunity to map it to the server of your choice.
Boot From SAN Volume Name: New Server 1 Volume 1 Copy 1
Source Volume Name: New Server 1 Volume 1
Create Now

Figure 65. Boot from SAN Replay Window

4 Click **Create Now**. The Map Volume to Server window appears.

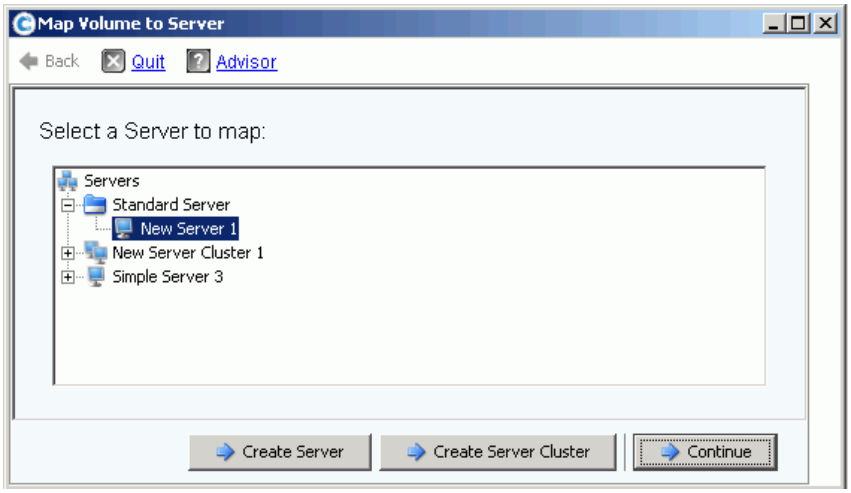


Figure 66. Map SAN Volume to Server

5 Create a Server, create a Server Cluster, or accept the defaults.

6 Click **Continue**. The Confirmation window appears.

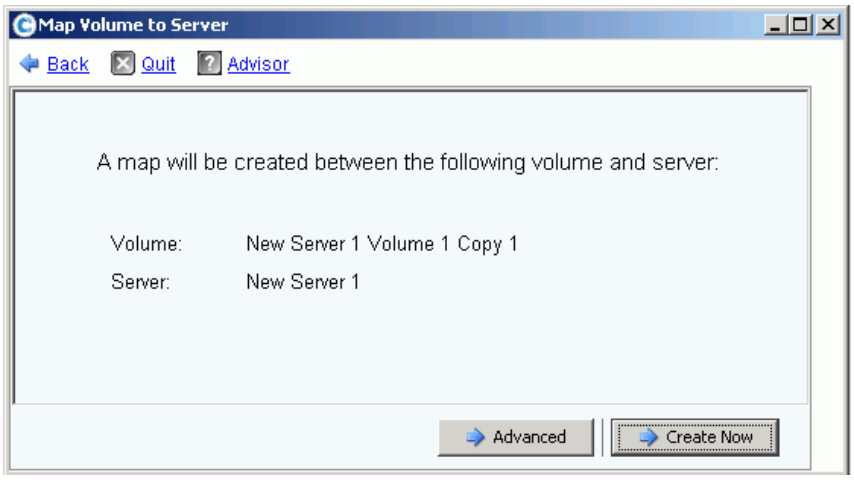


Figure 67. Confirm Map Boot Volume to Server

7 If you select **Advanced**, the Advanced Options window appears.

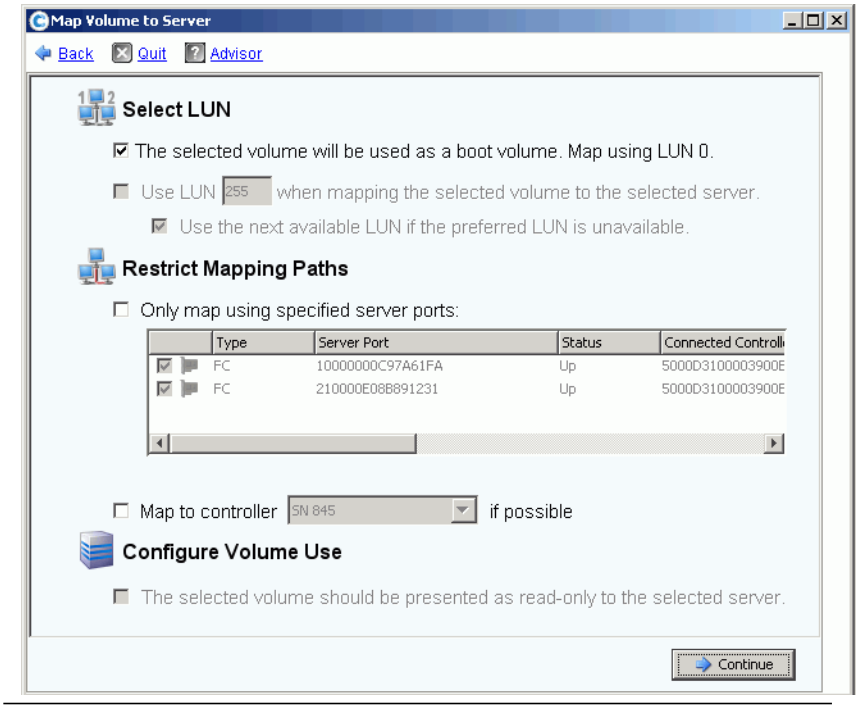


Figure 68. Boot from SAN Options Window

8 You can:

- Enter a Logical Unit Number (LUN).
- Restrict Mapping Paths
- Configure the Volume as Read-Only

For more information on these options, refer to Advanced Mapping Options on page 74. Click **Continue**.

9 Click **Create Now**. The Boot from SAN volume is created.

Modifying Volumes

Modifying a Volume

In the Create Volume from a Server window, click **Modify**. The Modify volume window appears.

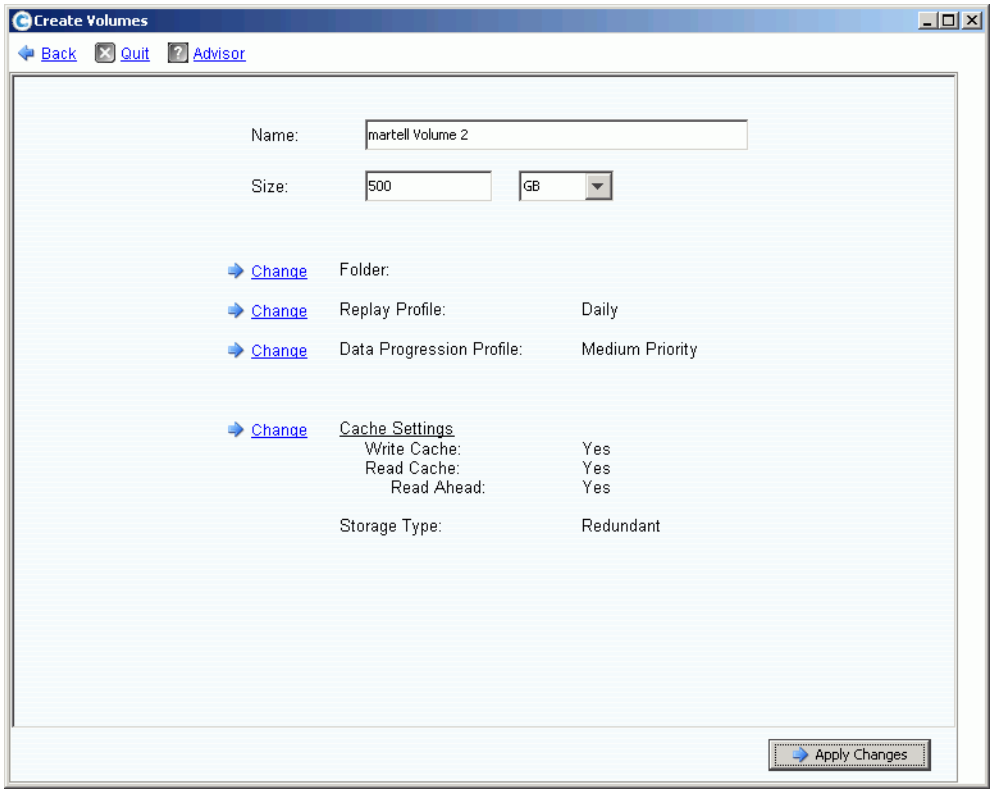


Figure 69. Modify Volume

You can:

- Change the folder in which the volume resides
- If Data Instant Replay is enabled, select a Replay Profile attached to this volume
- If Data Progression is licensed for this system and you are allowed to make changes, select a Storage Profile attached to this volume.
- If you are allowed to change cache settings, the type of cache enabled.

Changing Volume Properties

1 In the system tree, select a volume.

2 From the shortcut menu, select **Properties**. The Volume Properties window appears with the General tab selected.

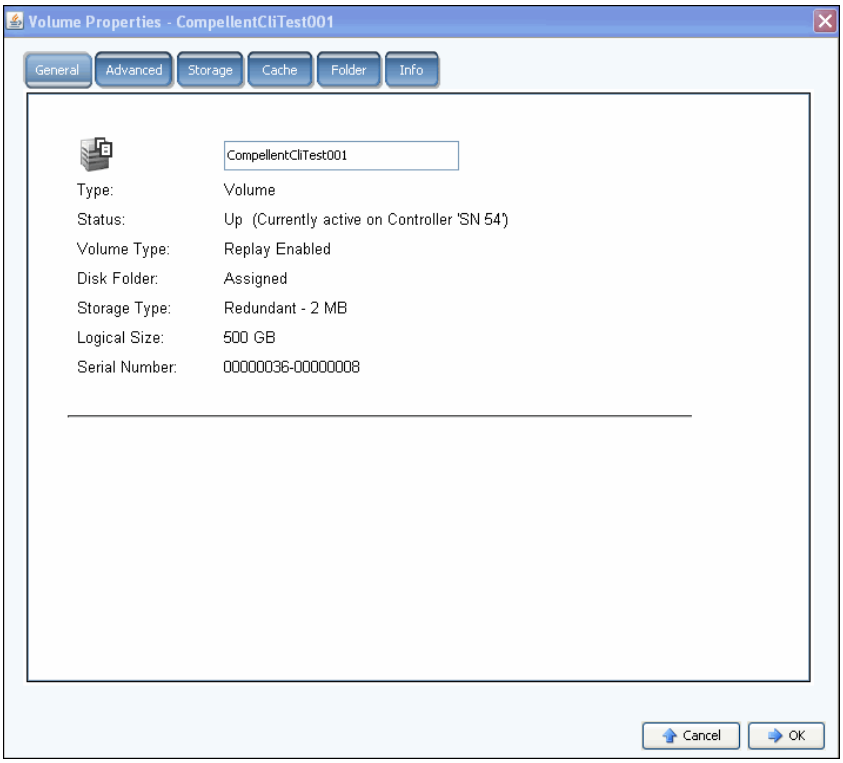


Figure 70. General Volume Properties

3 General Volume Properties include:

- Name and type: You can type in a new volume name.
- Status: Can be up or down. Controller on which volume is active.
- Volume Type: can be dynamic, Replay enabled, or Replication. A volume is dynamic until at least one Replay has been taken of that volume. Once a Replay has been taken of a volume, it becomes Replay Enabled. A Replication volume is one that is being Replicated to another Storage Center system.
- Disk Folder: Disk folder in which this volume resides
- Storage Type: Type of Redundancy and Storage Type size. (Refer to Non-Standard Storage Types on page 138.)
- Logical Size: Size of volume as seen by the Server.
- Serial Number

4 Click **OK** to save changes.

To change advanced volume properties

1. Click the Advanced tab.
2. Do any of the following:
   - Modify the Volume Space Consumption Limit
   - Allow Replays to coalesce into active Replay to allow frozen Replays to coalesce into an active Replay.
   - Import data to the lowest tier of storage available based upon the configuration of the storage profile of the volume. No Replays are taken for the volume during data import. If this option is unchecked, by default data is written to the highest tier of storage configured for the volume.
   - If there are volumes on storage running the Open VMS operating system, this tab displays the Unique Disk ID (UQ ID) used to identify the volume.

     You may need to reset this value when recovering a volume from a Replay. For example, if you mapped a volume to a server, took a Replay, and then mounted a new view volume up to the server; the new view volume would have a new Disk ID and you would have to modify the value in this window to match the original Disk ID for the volume before the server will recognize it as the same volume.

To change volume cache properties

1. Click the Cache tab.
2. In the Volume Properties window, click the Cache tab. (Caching that is set system-wide overwrites individual volume cache.)
3. Do any of the following:
   - Select or clear write cache. Write Cache holds written data in volatile memory until it can be safely stored on disk. Write Cache protects in the event of a power loss.
   - Select or clear read cache. Read Cache anticipates the next Read and holds it in quick volatile memory, thus improving Read performance. Read Ahead can be used for sequential reads, such as video.
4. Click **OK** to save changes.

To change volume folder properties

1. Click the Folders tab. The Volume Folder window appears. System Manager lists all volume folders and subfolders. The folder in which the volume resides is highlighted.
2. To move the selected volume to a different folder:
   a. In the Volume Properties window, click Folder. A list of volume folders appears.
   b. Select a folder to which to move the volume.
   c. Click **OK**. The folder is moved.

To change volume information properties

1. Click the Info tab. The Info window appears. Information includes:
   - Date Volume was created

- User who created the volume
- Date volume was last updated
- User who updated the volume

2 Enter any optional notes (up to 255 characters) and click **OK**.

Deleting a Volume

1 In the system tree, select a volume.

2 From the shortcut menu, select **Delete**. System Manager informs you if the volume is actively mapped to a server and asks you to confirm.

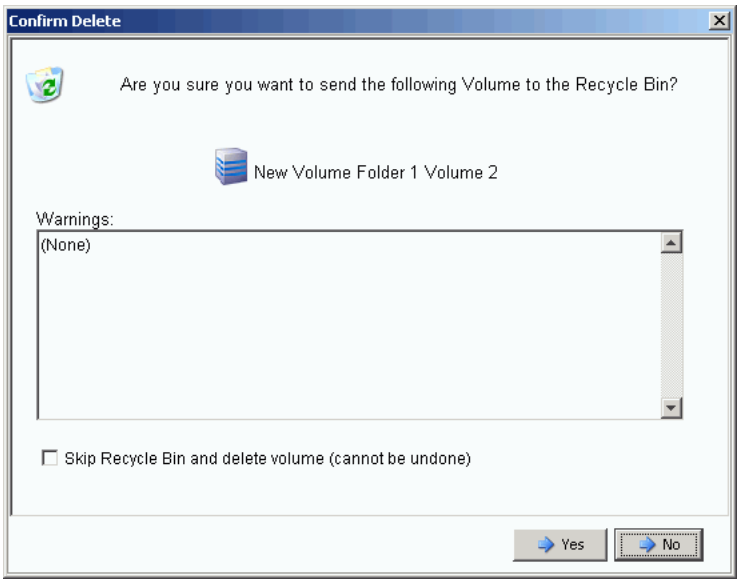

Confirm Delete
Are you sure you want to send the following Volume to the Recycle Bin?
New Volume Folder 1 Volume 2
Warnings:
(None)
Skip Recycle Bin and delete volume (cannot be undone)
Yes
No

Figure 71. Delete Volume

Note By default, a deleted volume is moved to the Recycle Bin. You can recover the volume from the Recycle Bin, but once the Recycle Bin is emptied, data on that volume cannot be recovered.

3 (Optional - and not recommended) You can immediately delete the volume and not save the metadata in the Recycle Bin by checking **Skip Recycle Bin**.

4 Click **Yes**. The volume is deleted.

Deleting Multiple Volumes

1. In the system tree, select a volume folder. The list of volumes appears in the main frame.
2. In the main window, select volumes by holding down the **Shift** key or **Ctrl** key and clicking on volumes.
3. From the shortcut menu at the top of the window, choose **Delete**. System Manager warns you if a volume is mapped to a server.
4. System Manager asks you to confirm. Click **Yes**. The volumes are deleted.

Restoring a Deleted Volume

When a volume is deleted, it is moved to the Recycle Bin. You can restore a deleted volume from the Recycle Bin.

Once the Recycle Bin is emptied, any items in the Recycle bin are gone and cannot be restored.

To restore a volume from the recycle bin

1. In the system tree, expand Storage > Volumes to view volume components including the **Recycle Bin**.
2. Expand the **Recycle Bin**. The Recycle Bin lists restorable volumes.
3. Select the volume to be restored.
4. From the shortcut menu, choose **Restore Volume**. The volume is restored. Previous mappings are not restored.

Expanding a Volume

Virtual capacity may be greater than the physical capacity.

To expand the virtual capacity of a volume

1. In the system tree, select a volume.
2. From the shortcut menu, select **Expand Volume**. The Expand Volume window appears.
3. Choose a number in blocks, Gigabytes, Terabytes, or Petabytes.
4. Click **Continue**. System Manager warns you that because of overhead, the actual final size will be slightly larger than the size indicated.
5. Click **Expand Volume Now**.

Managing Volume Folders

Creating a Volume Folder

Volume folders organize volumes. You can restrict access to folders through a combination of User Groups and User Privileges.

To create a volume folder

1 From the Storage Management window, select **Create > Folder > Volume Folder**. The Create Volume Folder window appears.

2 You can create the folder at the root level (Volumes) or within another folder.

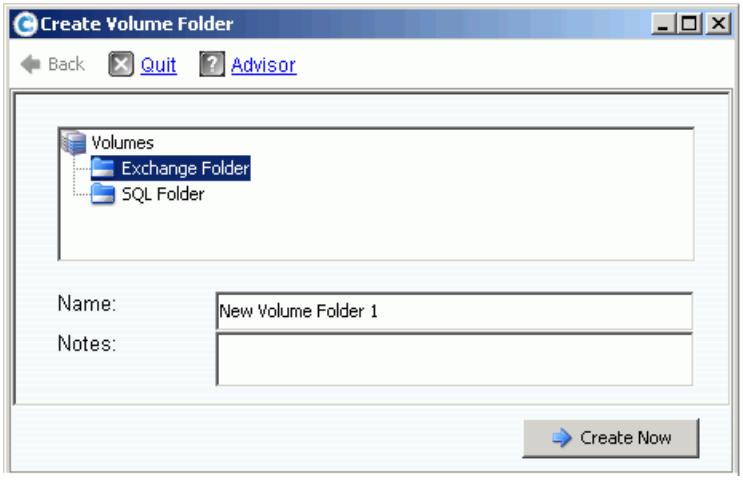


Figure 72. Create Volume Folder

3 Enter a volume folder name, or accept the default. Enter any Notes (up to 255 characters).

4 Click **Create Now**. The volume folder is created.

Viewing a List of Volume Folders

1 In the System Tree, select **Volumes**. The system lists volumes and volume folders.

2 In the main window select more than one volume folder by holding down the **Shift** or **Ctrl** key and selecting more than one volume folder.

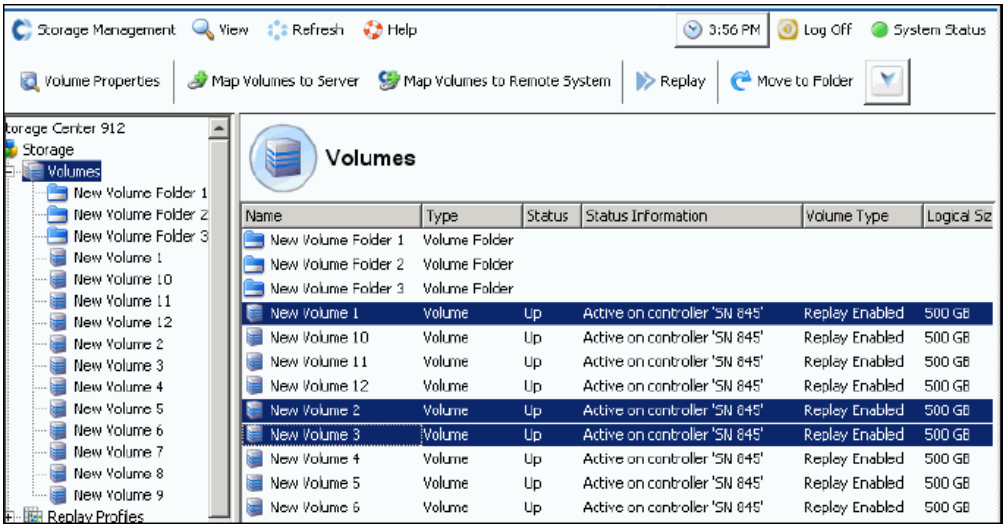

Storage Management
View
Refresh
Help
3:56 PM
Log Off
System Status
Volume Properties
Map Volumes to Server
Map Volumes to Remote System
Replay
Move to Folder
Storage Center 912
Storage
Volumes
New Volume Folder 1
New Volume Folder 2
New Volume Folder 3
New Volume 1
New Volume 10
New Volume 11
New Volume 12
New Volume 2
New Volume 3
New Volume 4
New Volume 5
New Volume 6
New Volume 7
New Volume 8
New Volume 9
Replay Profiles
Volumes
Name
Type
Status
Status Information
Volume Type
Logical Siz
New Volume Folder 1 Volume Folder
New Volume Folder 2 Volume Folder
New Volume Folder 3 Volume Folder
New Volume 1 Volume Up Active on controller 'SN 845' Replay Enabled 500 GB
New Volume 10 Volume Up Active on controller 'SN 845' Replay Enabled 500 GB
New Volume 11 Volume Up Active on controller 'SN 845' Replay Enabled 500 GB
New Volume 12 Volume Up Active on controller 'SN 845' Replay Enabled 500 GB
New Volume 2 Volume Up Active on controller 'SN 845' Replay Enabled 500 GB
New Volume 3 Volume Up Active on controller 'SN 845' Replay Enabled 500 GB
New Volume 4 Volume Up Active on controller 'SN 845' Replay Enabled 500 GB
New Volume 5 Volume Up Active on controller 'SN 845' Replay Enabled 500 GB
New Volume 6 Volume Up Active on controller 'SN 845' Replay Enabled 500 GB

Figure 73. Select Multiple Volume Folders

Using the shortcut menu, you can:

- Create or apply Replay Profiles to all the volumes in the selected folders.
- Move the selected folders into another folder.
- Delete multiple volume folders.
- Storage Profiles appear if you are allowed to select a Storage Profile. Refer to User Volume Defaults - Advanced on page 274.

Viewing Volume Folder Properties

1 In the System Tree, select a folder.

2 Click **Continue**. The General Volume Folder Properties window appears. To change the name of the folder, enter a new name.

3 Click **OK**.

4 Click the Info tab to view Date Created, Created By, Date Updated, Updated By, and Notes (up to 255 characters).

Deleting a Volume Folder

You cannot delete a volume folder that contains volumes, other volume folders, or is referenced by volumes that are in the recycle bin.

To delete a folder

1. In the system tree, select a volume folder.
2. From the shortcut menu, select **Delete**.
3. Click **Continue**.
4. System Manager asks you to confirm.
5. Click **Yes**. The folder is deleted.

Moving a Volume to a Folder

1. In the system tree, select a volume.
2. From the shortcut menu, select **Move to Folder**. The Move Volume window appears. Select a folder to which to move the volume.
3. Click **Continue**. System Manager asks you to confirm.
4. Click **Apply Now**. The volume is moved to the selected folder.

To move more than one volume at a time to a folder:

1. In the system tree, select a volume folder. The list of volumes appears in the main window.
2. In the main window select volumes by holding down the **Shift** key or **Ctrl** key and clicking on volumes.
3. From the shortcut menu at the top of the window, choose **Move to Folder**. The Move Volumes window appears.
4. From the list of folders displayed, select the folder to which to move the volumes.
5. System Manager asks you to confirm. Click **Apply Now**. The volumes are moved.

Moving Multiple Volumes to Another Folder

1 Expand the system tree to view **Volumes**. Using the **Shift** or **Ctrl** key, select multiple volumes.

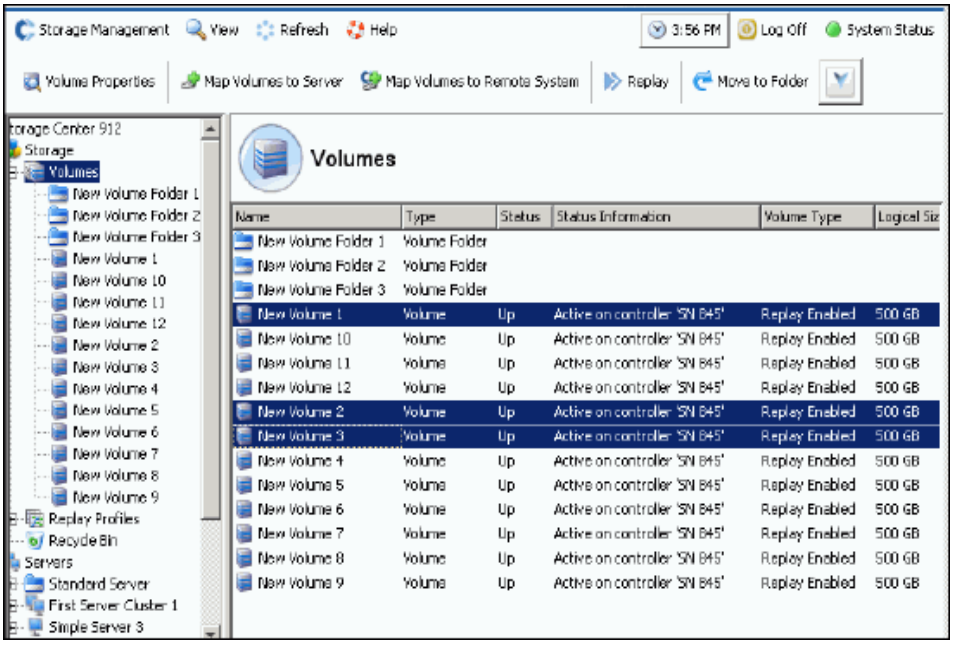

Storage Management
View
Refresh
Help
3:56 PM
Log Off
System Status
Volume Properties
Map Volumes to Server
Map Volumes to Remote System
Replay
Move to Folder
Storage Center 912
Storage
Volumes
New Volume Folder 1
New Volume Folder 2
New Volume Folder 3
New Volume 1
New Volume 10
New Volume 11
New Volume 12
New Volume 2
New Volume 3
New Volume 4
New Volume 5
New Volume 6
New Volume 7
New Volume 8
New Volume 9
Replay Profiles
Recycle Bin
Servers
Standard Server
First Server Cluster 1
Simple Server 3
Volumes
Name
Type
Status
Status Information
Volume Type
Logical Siz
New Volume Folder 1 Volume Folder
New Volume Folder 2 Volume Folder
New Volume Folder 3 Volume Folder
New Volume 1 Volume Up Active on controller 'SN 845' Replay Enabled 500 GB
New Volume 10 Volume Up Active on controller 'SN 845' Replay Enabled 500 GB
New Volume 11 Volume Up Active on controller 'SN 845' Replay Enabled 500 GB
New Volume 12 Volume Up Active on controller 'SN 845' Replay Enabled 500 GB
New Volume 2 Volume Up Active on controller 'SN 845' Replay Enabled 500 GB
New Volume 3 Volume Up Active on controller 'SN 845' Replay Enabled 500 GB
New Volume 4 Volume Up Active on controller 'SN 845' Replay Enabled 500 GB
New Volume 5 Volume Up Active on controller 'SN 845' Replay Enabled 500 GB
New Volume 6 Volume Up Active on controller 'SN 845' Replay Enabled 500 GB
New Volume 7 Volume Up Active on controller 'SN 845' Replay Enabled 500 GB
New Volume 8 Volume Up Active on controller 'SN 845' Replay Enabled 500 GB
New Volume 9 Volume Up Active on controller 'SN 845' Replay Enabled 500 GB

Figure 74. Selecting Multiple Volumes

2 From the shortcut menu, select **Move to Folder**. The Move Volume(s) window appears with a list of Volume folders.

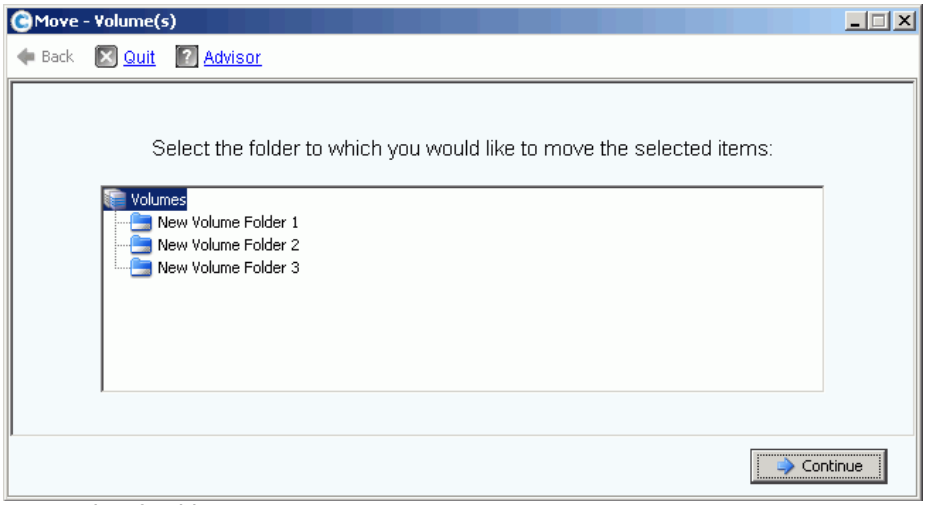


Figure 75. List of Folders

3 Select a folder to move the volumes to. Click **Continue**.

4 The system asks you to confirm. Click **Move Now.**

Applying Replay Profiles

Replays create space-efficient point-in-time copies (PITC) to provide immediate recovery from data loss. Storage Center Replays differ from the traditional PITCs because blocks of data or pages are frozen and not copied. No user data is moved, making the process efficient in both time taken to complete the Replay, and space used by Replays. Two default Replay Profiles are part of every Storage Center system. For information on creating Replays, refer to Data Instant Replay on page 283.

To view a list of Replay profiles on a system, select Replay Profiles. A list of Replay profiles appears. The list includes the name, the type, and by whom the Profile was created.

Note In general, Replay Profiles are created by a user, such as Admin or your user name. Two exceptions are Replay Profiles created by the System, and Replay Profiles created by the System Root User. Replay Profiles created by the System are the two default Replay Profiles that are part of every system. Replay Profiles created by the System Root User are Replay Templates created in System Manager Versions 4.0 or below. The prior templates were updated to current Replay Profiles during a system upgrade. Unlike Replay Templates, a change to a Replay Profile affects all the Replays of all volumes to which that Profile is attached.

View General Replay Profile Information

1. Select a Replay Profile in the system tree.
2. Click the **General** tab. General Replay Profile information includes:
   - **Name**
   - **Index**
   - **Type**
   - **Creation**
   - **Schedule**

Apply Replay Profiles to Server Volumes

1. From the system tree, select a server.
2. From the shortcut menu, select **Apply Replay Profiles to Volumes**. A list of Replay Profiles appears.

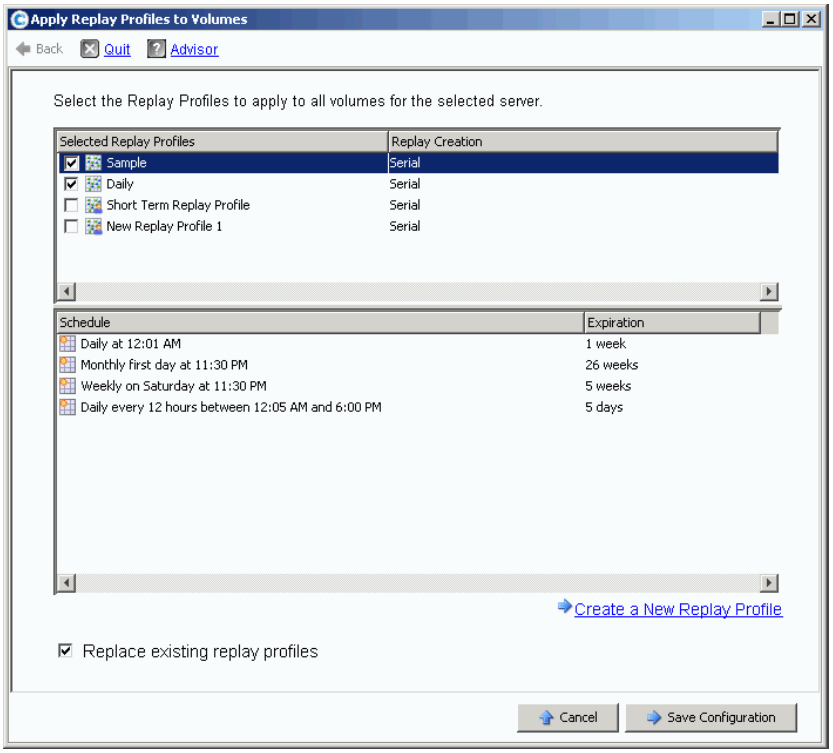


Figure 76. Apply Replay Profiles to Server Volumes

3 Select one or more Relay Profiles or create a new Replay Profile. For information on creating Replay Profiles, refer to Creating Replay Profiles on page 292.

4 Choose to replace existing Replay Profiles attached to the volumes mapped to this server or not.

5 Click **Save Configuration**. The Replay Profiles are attached.

Copy, Mirror, and Migrate

Copying a Volume

Copy copies data from source volume to destination volume. Changes made to the source volume during the copy process are added to the destination volume. Copy does not dynamically update the destination volume after the copy is completed.

To make a copy of a volume

1 In the system tree, select a volume.

2 From the shortcut menu, select **Copy > Copy Volume**. The Copy Volume window appears.

3 Select a destination volume.

a To copy the source volume to an existing volume, select a destination volume from the list of volumes displayed. The destination volume cannot be smaller than the source volume. The destination volume cannot be mapped to a server. Click **Continue**.

b Specify a priority relative to other Copy/Mirror/Migrate and Replication operations, Low, Medium, or High.

c By checking **Copy Historical Replay information**, you are copying the volume and all associated Replays. If you do not select this option, you exclude Replay data from being copied. Click **Continue**.

- To copy to and create a new volume, click **Create New Volume**. Follow the procedure described Creating a Volume on page 67.
- To copy a new volume with the same attributes as the source volume, click **Create Exact Duplicate**. A duplicate volume is immediately created.
- If Remote Instant Replay is licensed, you can click **Create Replication Volume**. This command does not create a volume, but serves as a conduit for Replications.

d Click **Continue**. A review window appears.

e Click **Start** to mirror the volume now. Click **Schedule** to set the start date and time. In the scheduling window, enter a date and time.

Mirroring a Volume

Mirror dynamically updates the destination volume when the source volume changes. The source and destination volumes are kept synchronized.

To create a volume mirror

1 In the system tree, select a volume.

2 From the volume shortcut menu, select **Copy > Mirror Volume**. The Mirror Volume window appears.

3 Select a destination volume.

a To mirror the source volume to an existing volume, select a destination volume from the list of volumes displayed. The destination volume cannot be smaller than the source volume. The destination volume cannot be mapped to a server. Click **Continue**.

- Specify a priority relative to other Copy/Mirror/Migrate and Replication operations.
- By checking **Copy Historical Replay information**, you are copying the volume and all associated Replays. If you do not select this option, you exclude Replay data from being copied. Click **Continue**.

b To mirror to and create a new volume, click **Create New Volume**. Follow the procedure described Creating a Volume on page 67.

c To create a new volume with the same attributes as the source volume, click **Create Exact Duplicate**. A duplicate volume is immediately created.

d If Remote Instant Replay is licensed, the **Create Replication Volume** button appears. This command does not create a volume, but serves as a conduit for Replications.

4 Click **Continue**. A review window appears. Click **Start** to mirror the volume now. Click **Schedule** to set the start date and time. In the scheduling window, enter a date and time. Click **Schedule Now**.

Migrating a Volume

Migrate is the same as Copy, except that when the copy is finished, all volume-server mappings are moved to the destination volume. The source volume is deleted. The copied data (and its mappings) now reside on the destination volume. Copy/Migrate first copies data from the source volume to the destination volume. Changes to the source volume while the copy is in progress are reflected in the destination volume. When Storage System Manager is finished with the copy, all volume-to-server mappings are moved to the destination volume.

To migrate a volume

1 In the system tree, select a volume.

2 From the volume shortcut menu, select **Copy > Copy/Migrate**. The Copy/Migrate Volume window appears.

3 Select a destination volume

a To migrate data to an existing volume, select a destination volume from the list of volumes displayed. The destination volume cannot be smaller than the source volume. The destination volume cannot be mapped to a server. Click **Continue**. Complete the Copy/Migrate options:

- Specify a priority relative to other Copy/Mirror/Migrate and Replication operations.
- By checking **Copy Historical Replay Information**, you are copying the volume and all associated Replays. If you do not select this option, you exclude Replay data from being copied.
- Select or clear **Delete Source Volume After Migration**.
- Select or clear **Reverse Mirror After Migrate**. Storage Center mirrors updates back to the source volume after the Copy/Migrate command is complete, using the source volume as a backup.
- Click **Continue**.

- The Copy/Migrate options are displayed. Click **Continue** to migrate now. Click **Schedule** to schedule the migration at a later time.

b To mirror to and create a new volume, click **Create New Volume**. Follow the procedure described Creating Volumes on page 67.

c To create a new volume with the same attributes as the current volume, click **Create Exact Duplicate**. A duplicate volume is immediately created.

d Click **Create Replication Volume** if Remote Instant Replay is licensed. This command does not create a volume, but serves as a conduit for Replications.

4 Click **Continue**. A review window appears. Click **Start** to mirror the volume now. Click **Schedule** to set the start date and time. In the scheduling window, enter a date and time. Click **Schedule Now**.

5 Click **OK**.

Viewing Copy/Mirror/Migrate Events

From the **View** menu, choose Copy/Mirror/Migrate. The Copy/Mirror/Migrate view appears. The Copy/Mirror/Migrate view displays:

- **Type**
- **State**
- **Priority**
- **Source volume**
- **Destination volume**
- **Percent synchronized**
- **Size of data that remains to be synchronized**
- **Current Replay**
- **Copy History**
- Information about whether the system will delete the volume after migration (Migrate)
- Whether the system performs a reverse mirror after migration (Mirror)

Viewing Volume Information

In the system tree, click **Storage**. The Storage window appears.

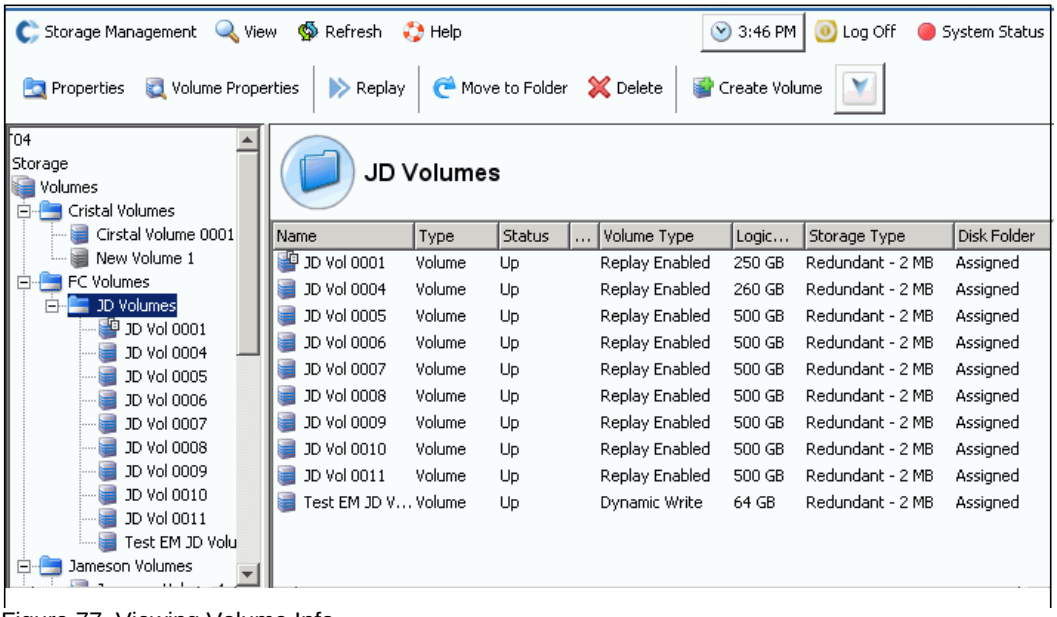

Storage Management
View
Refresh
Help
3:46 PM
Log Off
System Status
Properties
Volume Properties
Replay
Move to Folder
Delete
Create Volume
04
Storage
Volumes
Cristal Volumes
Cirstal Volume 0001
New Volume 1
FC Volumes
JD Volumes
JD Vol 0001
JD Vol 0004
JD Vol 0005
JD Vol 0006
JD Vol 0007
JD Vol 0008
JD Vol 0009
JD Vol 0010
JD Vol 0011
Test EM JD Volu
Jameson Volumes
JD Volumes
Name
Type
Status
...
Volume Type
Logic...
Storage Type
Disk Folder
JD Vol 0001 Volume Up Replay Enabled 250 GB Redundant - 2 MB Assigned
JD Vol 0004 Volume Up Replay Enabled 260 GB Redundant - 2 MB Assigned
JD Vol 0005 Volume Up Replay Enabled 500 GB Redundant - 2 MB Assigned
JD Vol 0006 Volume Up Replay Enabled 500 GB Redundant - 2 MB Assigned
JD Vol 0007 Volume Up Replay Enabled 500 GB Redundant - 2 MB Assigned
JD Vol 0008 Volume Up Replay Enabled 500 GB Redundant - 2 MB Assigned
JD Vol 0009 Volume Up Replay Enabled 500 GB Redundant - 2 MB Assigned
JD Vol 0010 Volume Up Replay Enabled 500 GB Redundant - 2 MB Assigned
JD Vol 0011 Volume Up Replay Enabled 500 GB Redundant - 2 MB Assigned
Test EM JD V... Volume Up Dynamic Write 64 GB Redundant - 2 MB Assigned

Figure 77. Viewing Volume Info

Volume information displays status of volumes. To view information for all volumes in a folder, in the system tree, select the top Volumes folder. System Manager lists the folders and volumes within that folder.

Information includes:

- **Name**: Shows the name of the volume.
- **Type**: Displays the type – volume or a volume folder
- **Status**: Shows volume status: up or down
- **Status Information**: If an element is down, this field displays the reason it is down
- **Volume Type**: Dynamic, Replay Enabled, or Replication.
  - **Dynamic Volume**: A volume for which no Replays have been taken. Exists on the system as a read/write volume. Data Progression manages the volume allocations in configure Volume Active space only.
  - **Replay Enabled Volume**: A volume that has at least one Replay. A Replay-enabled volume consists of two different layers of volume space: Active (writable) and Replay (historical, or read-only). Once a Replay is taken on a volume, the active data that exists on that volume is marked as read-only and is moved to the Tier and Class that is configured for Replays. New data written to the volume after the Replay is written to active portion of the volume; however the Replay area may still be accessible for reads. As more changes to the volume occur (as writes in the active space) and as more Replays are taken, some of the Replay data may become inaccessible. This is known as Replay overhead. This data can be made available by creating a view volume to allow for data recovery or backups.
  - **Replication Volume**: A target volume that is being replicated from another system.
- **Logical Size**: Shows the logical size of the volume.
- **Replay Profile**: Shows the Replay profile attached to the volume.

- **Storage Profile**: Shows the Storage Profile attached to the volume.
- **Storage Type**: Maximum-use are redundant with a datapage size of 2 MB. Other are described in Non-Standard Storage Types on page 138.
- **Disk folder**: Folder the volume is using.

Note Replays and Replay Profiles appear if a system is licensed for Data Instant Replay. Replication information appears if a system is licensed for Synchronous Remote Instant Replay or Asynchronous Remote Instant Replay.

Viewing General Volume Information

Select the volume in the system tree. The Volume window with the **General** tab selected appears.

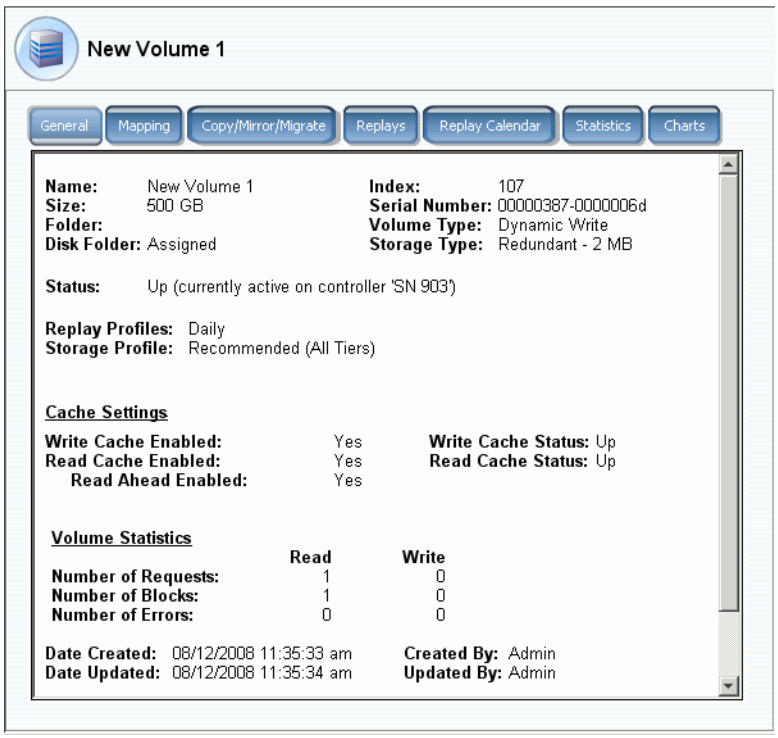


Figure 78. Individual Volume Information

General volume information tab includes:

- **Name:** Volume name.
- **Index**: Number used by Dell Support Services to assist with component identification.
- **Size**: Volume size.
- **Serial Number**: Volume Serial Number (VSN).
- **Folder**: Disk folder that the volume uses for storage.
- **Volume Type**: Active or Replay Enabled. If no Replay has been taken for a volume, it is Active. Once a Replay has been taken, it is Replay Enabled.
- **Disk Folder**: Folder that the volume uses for storage.
- **Status**: Up or Down. If a volume is not mapped to a server, the system displays the message: “down (currently inactive - map to a server to activate)”.
- **Replay Profiles**: Those used for this volume.

- **Storage Profile**: Profile attached to this volume (by default, the Recommended Storage Profile).
- **Cache Settings**: Those enabled for various Read/Write operations.
- **Volume Statistics**: Number of requests, blocks, and errors for Read/Write operations.
- **Date Created / Date Updated**: Display of when and by whom.

Viewing Volume Mapping

In the system tree, select a volume. In the Volume Information window, select **Mapping**. The system displays:

- **Status**: Shows volume status: up or down
- **Name:** Name of server to which the volume is mapped
- **Type of Server**: FC or iSCSI
- **World Wide Name (WWN)**: WWN of the server port
- **Server Port**
- **Controller Port**
- **LUN**
- Whether the volume is read only (yes or no)

Viewing Copy/Mirror/Migrate Information

1. In the system tree, select a volume..
2. Click the **Copy/Mirror/Migrate** tab. The **Copy, Mirror, Migrate** window appears. System Manager displays the following information:

- **Type**: Can be Replication, Replication mirror, or copy migrate
- **State**: Can be running or down
- **Priority**: Can be High, Medium, or Low
- **Source Volume:** Name of volume from which data is copied
- **Destination Volume:** Name of volume to which data is being copied
- **Percent Synced**: Percentage that destination volume matches source volume
- **Remaining**: Percentage of data left to copy
- **Current Replay**: ID of latest Replay
- **Copy History**: History of Replays
- **Delete After Migrat**e: Will source volume be deleted after copy
- **Reverse Mirror After Migrate**: Copy back to original source

Viewing Replications

The Replication tab appears only with volumes which have been or are being Replicated. For information of Replication procedures and terms, refer to Remote Instant Replay on page 327.

Viewing and Modifying Replays

The Replay tab appears only on volumes for which there are Replays. From the system tree, select a volume . In the Volume Information window, select **Replays**. The system displays information about any Replays associated with the selected volume.

From this window, you can modify the following settings:

- **Set Update Frequency**: Default is Off.
- **Set Replay View**: Default is Show Volume Replays.
- **Set Display Field**: Default is Freeze Time.
- **Modify Volume Maximums**: Opens the Modify Volume Maximums wizard.

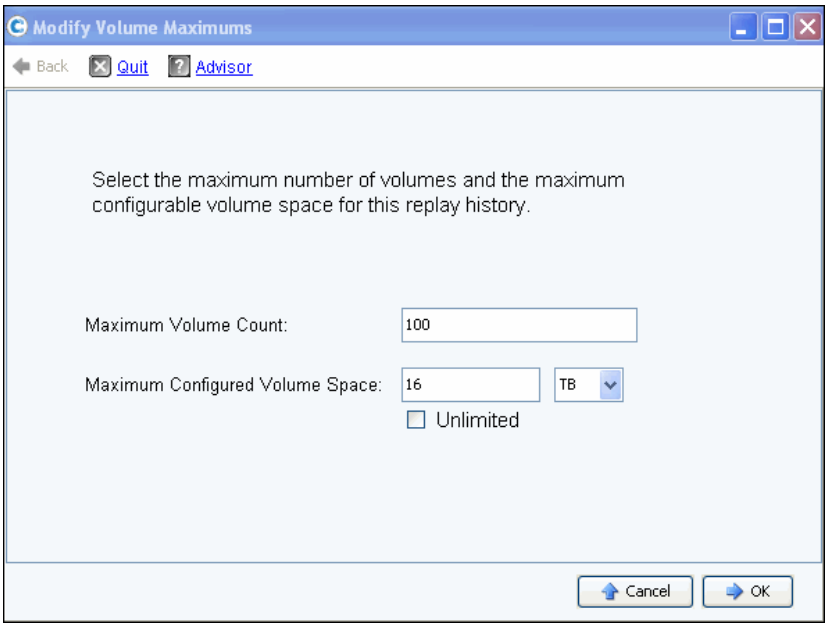


Figure 79. Modify Volume Maximums

Default is 100 maximum view volumes and 16 TB of configured volume space. This wizard allows you to modify these limits for:

- The number of view volumes that can be created, and
- The configured amount of space for all view volumes that share a Replay history. Can be set to megabytes, gigabytes, terabytes, or petabytes of space. The Unlimited option applies only to Maximum Configured Volume Space limits.

Note Additional view volumes for the Replay history cannot be created once either limit has been reached.

Viewing Replay Calendar

The Replay Calendar shows existing and scheduled Replays. For more information, refer to Viewing a Volume Replay Calendar on page 319.

Viewing Volume Statistics

Note If Data Progression is running, statistics are not available.

1 In the system tree, select a volume. The Volume Information window appears.

2 Click the **Statistics** tab. System Manager displays volume statistics.

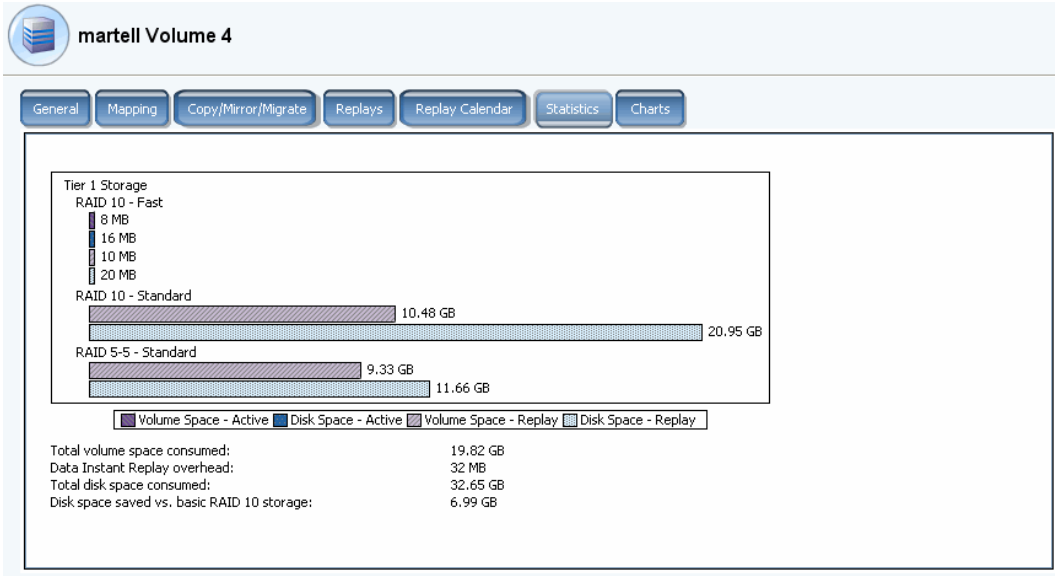


Figure 80. Volume Statistics

This window displays the following information in graphical form, per tier:

- **Volume Space – Active** shows the volume space utilized by the data that has been written before a Replay is taken.
- **Disk Space – Active** shows the total disk space including RAID overhead that is being used by this volume
- **Volume Space – Replay** shows the space used by Replays, including accessible and inaccessible Replay space. Refer to Moving a Volume to a Folder on page 93.
- **Disk Space – Replay** shows total disk space, including RAID overhead, being used by this volume.

Statistics below the chart list:

- **Total volume space consumed** equals the sum of all volume space bars on the chart.
- **Data Instant Replay overhead** is that part of Volume Space Replay that is inaccessible. This inaccessible data is previous pages that have been subsequently written to but are still parts of previous Replays. (**Total volume space consumed** minus **Data instant Replay overhead** equals the total volume space that would be consumed if all Replays were to be expired.)
- **Total disk space consumed** equals Disk Space-Replay plus Disk Space-Active

- **Disk space saved vs. basic RAID 10 storage** shows the storage savings through the effective use of RAID 5 rather than RAID 10. The difference between volume space consumed and disk space consumed is the space required for RAID parity. For example, a RAID 10 volume is written twice. The disk space required is twice the volume space required. Disk space is required for RAID 5 parity blocks that is not used in the volume space.

System Manager displays distribution usage for volumes and Replays for each disk tier and RAID selection within the tier. If there is no contention for storage space in the first RAID selection, it is assigned storage from that selection.

Viewing Volume Charts

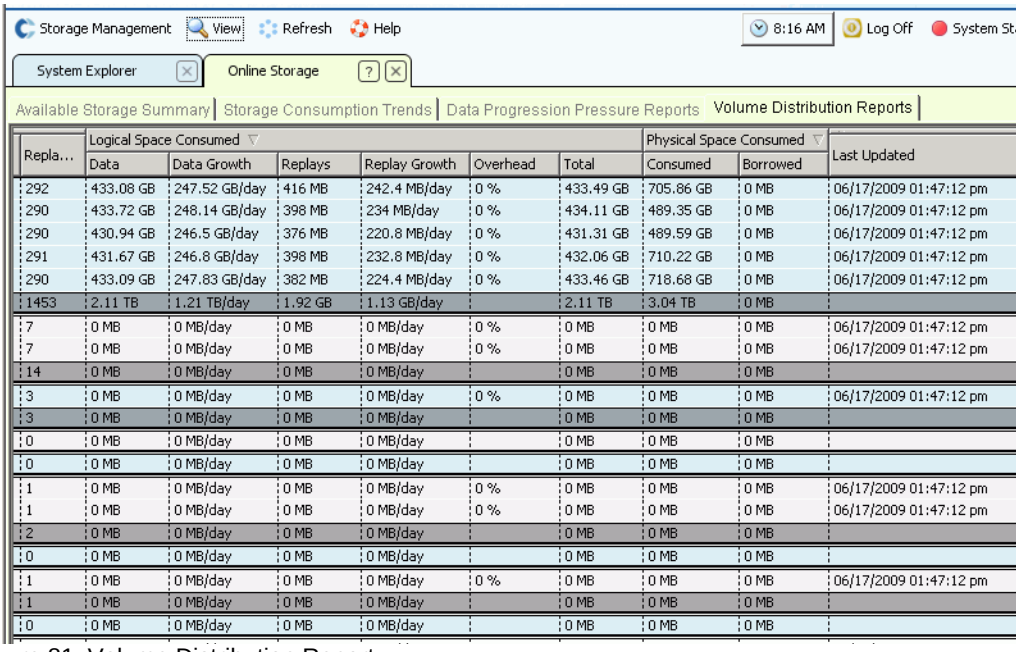
In the Volume Info window, click the **Charts** table. Charts display Read, Write, and total KB/sec and IO/sec in real time.

Viewing Volume Distribution Reports

The Volume Distribution Reports window displays how volumes are consuming storage space. Information includes the logical space of each volume is consumed, and the relationship between logical space and physical space.

To view the volume distribution report

1. From the View menu, select **Online Storage**.
2. Click the **Volume Distribution Report** tab. The Volume Distribution Report appears.



Repla...	Logical Space Consumed						Physical Space Consumed		Last Updated
	Data	Data Growth	Replays	Replay Growth	Overhead	Total	Consumed	Borrowed	
292	433.08 GB	247.52 GB/day	416 MB	242.4 MB/day	0 %	433.49 GB	705.86 GB	0 MB	06/17/2009 01:47:12 pm
290	433.72 GB	248.14 GB/day	398 MB	234 MB/day	0 %	434.11 GB	489.35 GB	0 MB	06/17/2009 01:47:12 pm
290	430.94 GB	246.5 GB/day	376 MB	220.8 MB/day	0 %	431.31 GB	489.59 GB	0 MB	06/17/2009 01:47:12 pm
291	431.67 GB	246.8 GB/day	398 MB	232.8 MB/day	0 %	432.06 GB	710.22 GB	0 MB	06/17/2009 01:47:12 pm
290	433.09 GB	247.83 GB/day	382 MB	224.4 MB/day	0 %	433.46 GB	718.68 GB	0 MB	06/17/2009 01:47:12 pm
1453	2.11 TB	1.21 TB/day	1.92 GB	1.13 GB/day		2.11 TB	3.04 TB	0 MB	
7	0 MB	0 MB/day	0 MB	0 MB/day	0 %	0 MB	0 MB	0 MB	06/17/2009 01:47:12 pm
7	0 MB	0 MB/day	0 MB	0 MB/day	0 %	0 MB	0 MB	0 MB	06/17/2009 01:47:12 pm
14	0 MB	0 MB/day	0 MB	0 MB/day		0 MB	0 MB	0 MB	
3	0 MB	0 MB/day	0 MB	0 MB/day	0 %	0 MB	0 MB	0 MB	06/17/2009 01:47:12 pm
3	0 MB	0 MB/day	0 MB	0 MB/day		0 MB	0 MB	0 MB	
0	0 MB	0 MB/day	0 MB	0 MB/day		0 MB	0 MB	0 MB	
0	0 MB	0 MB/day	0 MB	0 MB/day		0 MB	0 MB	0 MB	
1	0 MB	0 MB/day	0 MB	0 MB/day	0 %	0 MB	0 MB	0 MB	06/17/2009 01:47:12 pm
1	0 MB	0 MB/day	0 MB	0 MB/day	0 %	0 MB	0 MB	0 MB	06/17/2009 01:47:12 pm
2	0 MB	0 MB/day	0 MB	0 MB/day		0 MB	0 MB	0 MB	
0	0 MB	0 MB/day	0 MB	0 MB/day		0 MB	0 MB	0 MB	
1	0 MB	0 MB/day	0 MB	0 MB/day	0 %	0 MB	0 MB	0 MB	06/17/2009 01:47:12 pm
1	0 MB	0 MB/day	0 MB	0 MB/day		0 MB	0 MB	0 MB	
0	0 MB	0 MB/day	0 MB	0 MB/day		0 MB	0 MB	0 MB	

Figure 81. Volume Distribution Report

- **Server** - Storage Center groups volumes by the server to which they are mapped. The row beneath each server grouping details the totals for all volumes mapped to that server.
- **Name** of the volume.
- **Defined Size** is the defined logical size of the volume.
- **Replay Count** is the number of Replays associated with the volume. The Replay count includes the active Replay, each volume has a Replay count of at least one, even if no manual or scheduled Replays have been taken.
- **Logical Space Consumed** displays logical space consumed by a volume and additional space this volume is consuming because of the existence of Replays. It details growth rate trends for both the volume and the associated Replays. Because Replays contain information about changes that occurred on a volume over time, they take up some amount of space. For example, a volume and all of its Replays might consume 10 GB of space. If all the Replays were expired, the volume would only consume 8 GB of space. In this case, the Replay overhead is 2 GB.
- **Physical Space Consumed** details the physical disk space consumed by a volume and all associated Replays. If this volume is a View volume related to another volume, it could be borrowing space from that volume Replay branch because the two volumes share some Replays. The amount of space borrowed is indicated in the Borrowed column.

Viewing Multiple Volume Properties

1 In the system tree, select a volume folder. The list of volumes appears in the main frame.

2 In the main window select more than one volume by holding down the **Shift** or **Ctrl** key and selecting more than one volume.

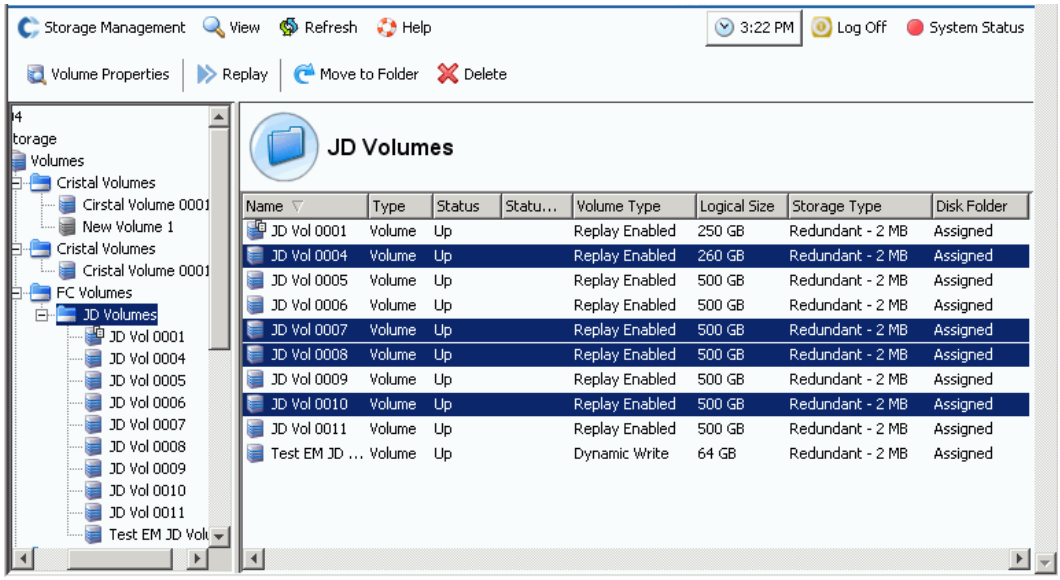

Storage Management
View
Refresh
Help
3:22 PM
Log Off
System Status
Volume Properties
Replay
Move to Folder
Delete
torage
Volumes
Cristal Volumes
Cirstal Volume 0001
New Volume 1
Cristal Volumes
Cristal Volume 0001
FC Volumes
JD Volumes
JD Vol 0001
JD Vol 0004
JD Vol 0005
JD Vol 0006
JD Vol 0007
JD Vol 0008
JD Vol 0009
JD Vol 0010
JD Vol 0011
JD Volumes
Name
Type
Status
Statu...
Volume Type
Logical Size
Storage Type
Disk Folder
JD Vol 0001 Volume Up Replay Enabled 250 GB Redundant - 2 MB Assigned
JD Vol 0004 Volume Up Replay Enabled 260 GB Redundant - 2 MB Assigned
JD Vol 0005 Volume Up Replay Enabled 500 GB Redundant - 2 MB Assigned
JD Vol 0006 Volume Up Replay Enabled 500 GB Redundant - 2 MB Assigned
JD Vol 0007 Volume Up Replay Enabled 500 GB Redundant - 2 MB Assigned
JD Vol 0008 Volume Up Replay Enabled 500 GB Redundant - 2 MB Assigned
JD Vol 0009 Volume Up Replay Enabled 500 GB Redundant - 2 MB Assigned
JD Vol 0010 Volume Up Replay Enabled 500 GB Redundant - 2 MB Assigned
JD Vol 0011 Volume Up Replay Enabled 500 GB Redundant - 2 MB Assigned
Test EM JD ... Volume Up Dynamic Write 64 GB Redundant - 2 MB Assigned

Figure 82. Select Multiple Volumes

3 From the shortcut menu, select **Properties**.

Multiple Volume General Properties

The General Multiple Volumes Property window displays the number and total volume space of the selected volumes.

Multiple Volume Cache Properties

To change the cache properties for the volumes you selected:

1 Click the **Cache** Tab. The **Volume Properties – Multiple Volume** window appears.

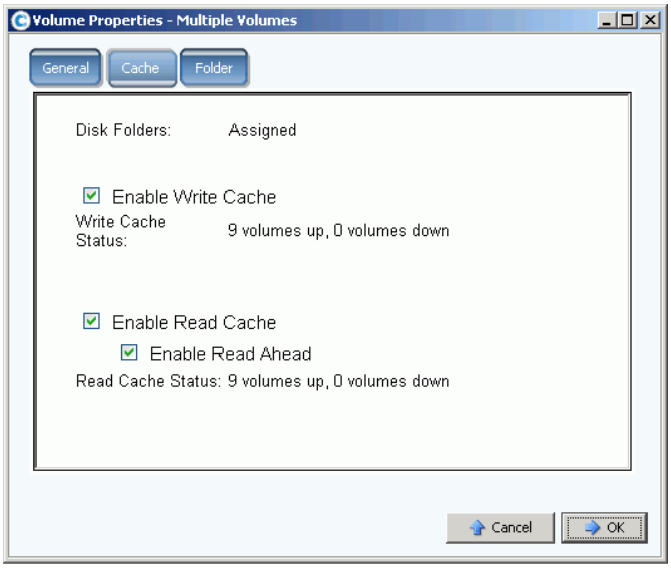


Figure 83. Multiple Volume Properties

- If no selected volumes have cache or Read Ahead enabled, the checkbox is blank.
- If some of the selected volume have cache or Read Ahead enabled and some are disabled, the checkbox is a solid green.
- If all of the selected volumes have cache or Read Ahead enabled, the checkbox has a check mark.

2 Select or clear **Enable Write Cache**.

3 Select or clear **Enable Read Cache**. If read cache is selected, select or clear **Enable Read Ahead**.

4 Click **OK** to save changes.

Note If your User Volume Defaults allow you to choose a Storage Profile, the **Volume Properties – Multiple Volume** window may include a **Storage** tab.

Multiple Volume Folder Properties

In **Volume Properties - Multiple Volumes**, select the **Folder** tab. The system displays volume folders on this system.

Note Other volume properties may appear, depending on your User Volume Defaults.

Recycle Bin

Deleting a volume moves data on the volume to the Recycle Bin. You can recover data from the Recycle Bin until the Recycle Bin is emptied. Once the Recycle Bin is emptied, you can not longer recover a volume.

To empty the recycle bin

From the Storage Management menu, choose **Volume** > **Empty Recycle Bin**. System Manager lists items in the recycle bin and asks you to confirm. Click **Yes**. The Recycle Bin is emptied.

Topology Explorer Volume Functions

With the Topology Explorer, you can map volumes to servers and external (remote) system easily by dragging one component to another.

To view the topology explorer

1 From the View menu choose **Topology Explorer**.

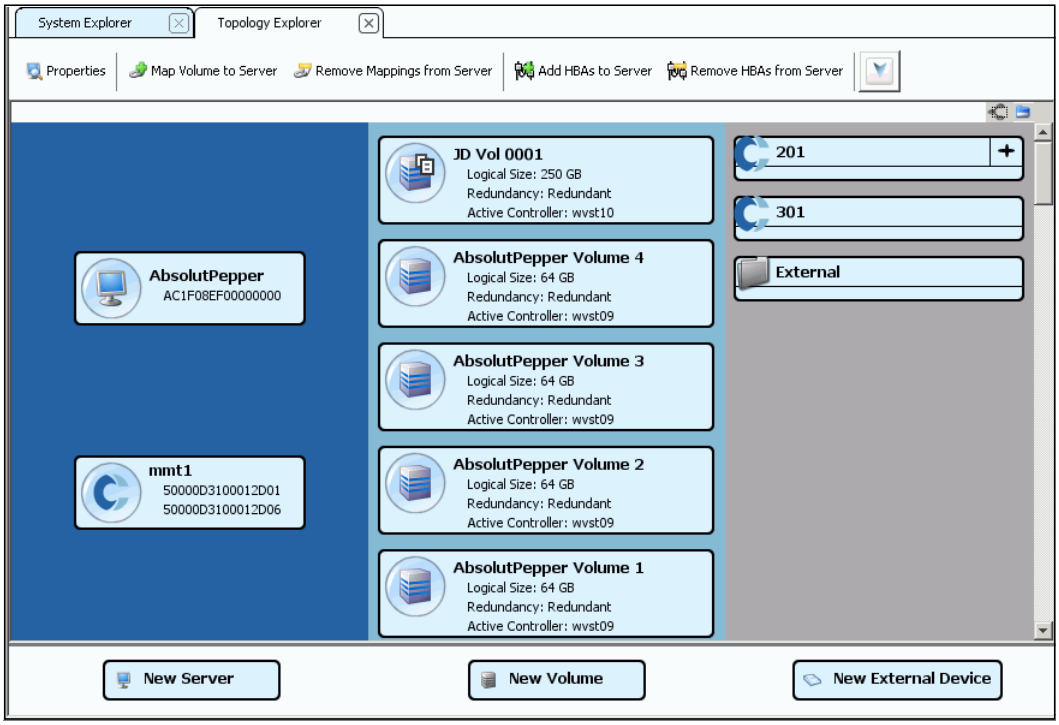


Figure 84. Topology Explorer without Folders

- Left column displays servers
- Middle column displays volumes
- Right column displays remote or external systems

The **Connections** button toggles between **Show All Connections** and **Show Connections for Selected Object Only**.

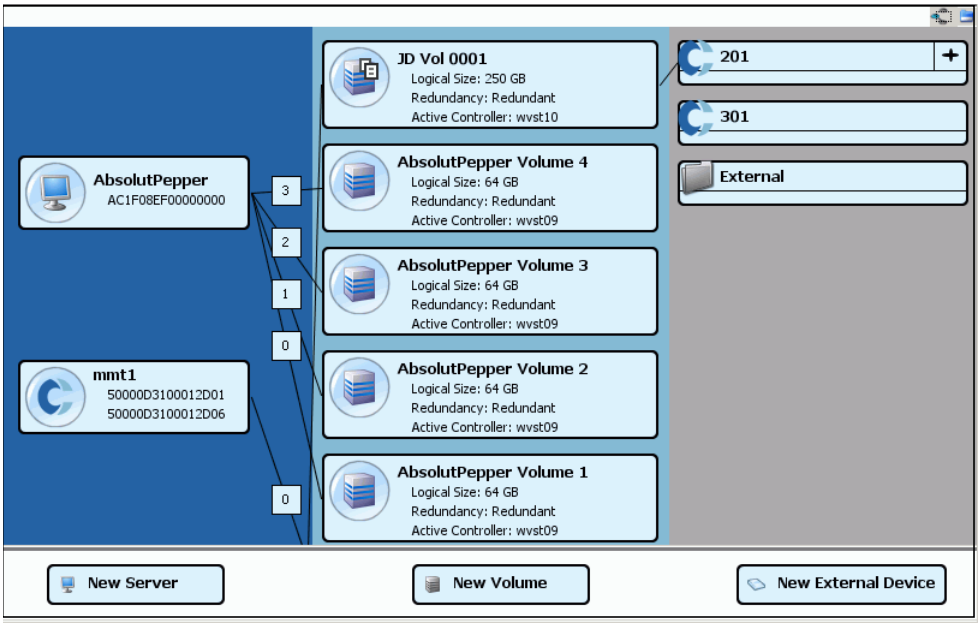


Figure 85. Show All Connections

Numbers indicate the logical unit for that map. When there are Replications, you will also see connections between the Volumes and the Remote Volume to which they are replicating.

Toggling the **Connections** button displays the connections of a selected object.

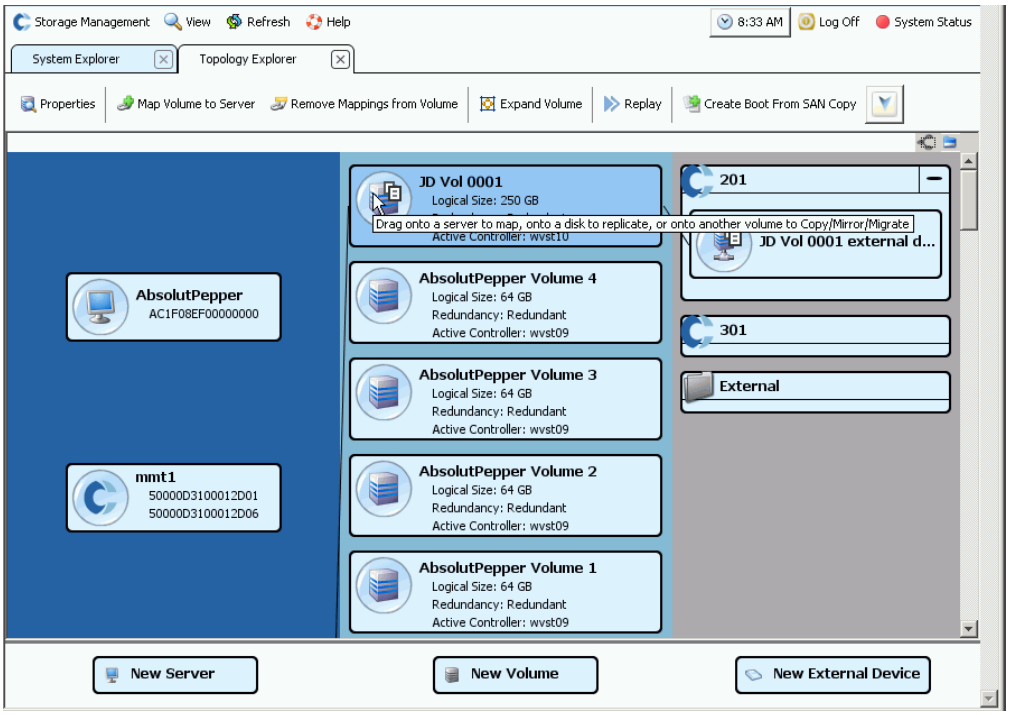


Figure 86. Connections for a Single Object

The **Folders** button toggles between showing and hiding folder. When the **Folders** button is toggled to show folders, a red line is drawn through the **Folders** button and unmapped folders are displayed.

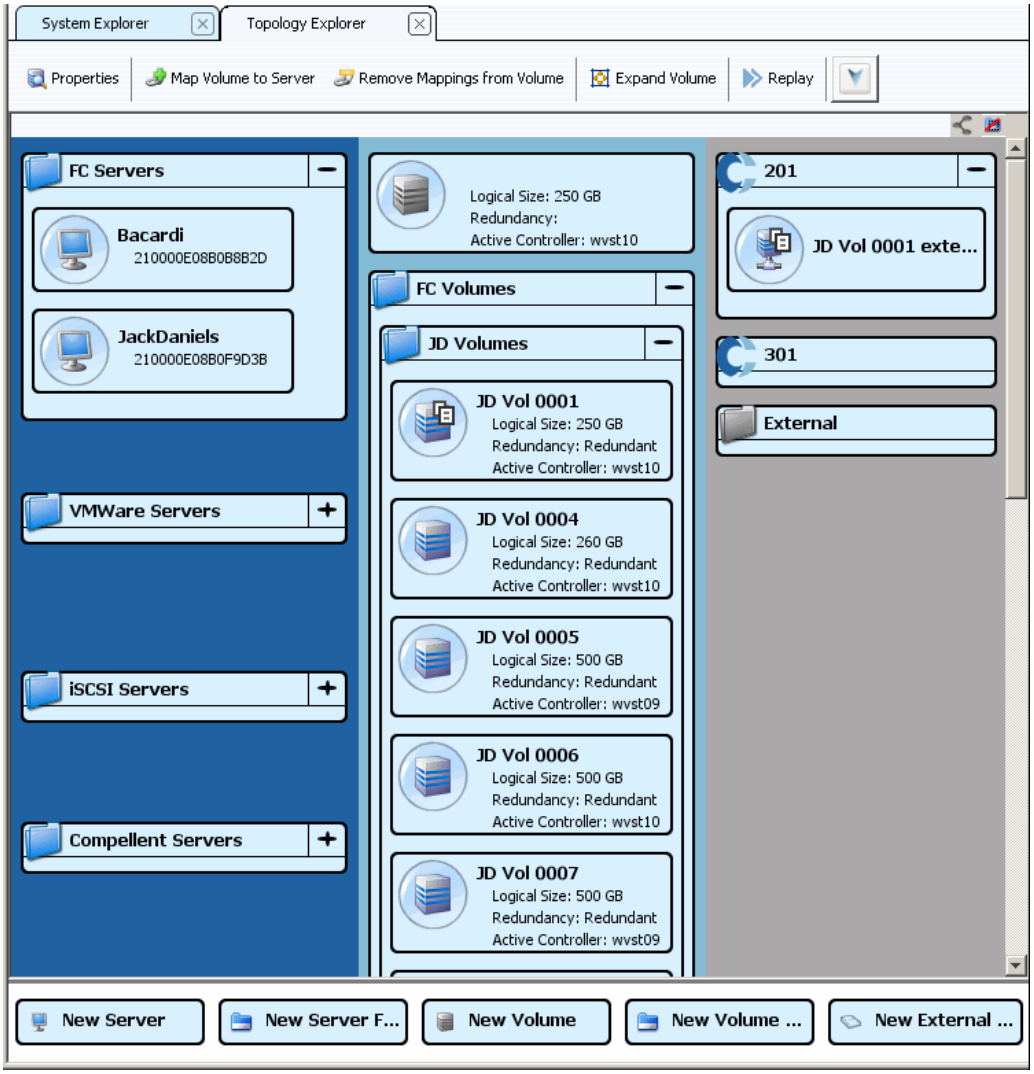


Figure 87. Topology View with Folders

Notice that when the Topology Explorer displays folders, two additional command objects appear at the bottom of the screen: **Create New Server Folder** and **Create New Volume Folder**.

Creating a Volume in the Topology Explorer

1. Drag the **New Volume** command object to the Topology Explorer window. The **Create New Volume** wizard opens.
2. Follow the **Create New Volume** wizard instructions.

Creating a Volume Folder in the Topology Explorer

1. Make sure the **Show Folders** toggle is enabled and the **Show Folder** command object appears.
2. Drag the **New Volume Folder** command object to the Topology Explorer window. The **Create New Volume Folder** wizard appears.
3. Follow the **Create New Volume Folder** wizard instructions.

Mapping a Volume to a Server in the Topology Explorer

1. Drag a server onto a volume or drag a volume onto a server. The **Mapping** window appears.
2. Following the **Mapping** wizard instructions.

Note The Topology Explorer manages Storage Center components only.

Creating an External Device with the Topology Explorer

1. Drag the **New External Device** command object to the Topology Explorer window. The **New External Device** wizard opens.
2. Follow the **New External Device** wizard instructions.

5 Disks

Introduction 114
Adding Disks to a Storage Center System 116
Configuring Storage 120
Rebalancing RAID 122
Managing Disks 126
Managed Disk Folders 130
Importing from External Device without Replication License 133
Non-Standard Storage Types 138

Introduction

This chapter describes how to view and manage disks and disk folders. Only Administrators can manage disks and disk folders. Some commands, indicated in the command description, are available only when specifically included in Administrative privileges.

System Manager displays disks both physically and logically. Physically, disks are grouped by the enclosure in which they reside as shown in the Enclosures folder icon.

- Logically, the System Manager groups disks by type, such as a 7K, 10K, 15K, and Solid State Disk (SSD). Disks types are grouped without regard to IO speed. For example, 7K disks in a SAS enclosure will be in the same RAID level as 7K drives in an SBOD enclosure. A disk folder contains both managed and spare drives. Managed drives are used for data storage; spare drives are held in reserve to automatically replace a drive if a managed drive fails.
- The ability of Storage Center to optimize data storage is hampered by systems using Advanced Options. Before using Advance Options, consult with Dell Support Services so that you understand the impact changes would have on your system.

Storage Types and Storage Classes

A storage type describes a pool of storage with one datapage size (512KB, 2MB, or 4MB) and either redundancy or no redundancy. Because Data Progression (an automatic process that moves old data to slower disks) cannot move data between storage types, a second storage type is a less efficient use of storage. Create a non-standard storage type only when an application requires a datapage size smaller or larger than the default 2-MB datapage. Only an Administrator can create a storage type, and only if his or her User Volume Defaults permit changes.

Storage classes exist within each storage type for which a disk folder has been prepared. Each storage class represents allocated RAID space within a tier of disks in the disk folder. For redundant storage types, RAID levels of storage classes within each tier depend on the redundancy level selected for that tier.

- Single redundant tiers can contain storage classes of RAID 10, RAID 5-5, or RAID 5-9.
- Dual redundant tiers can contain storage classes of RAID 10-Dual Mirror, RAID 6-6, or RAID 6-10.
- Non-redundant storage types use RAID 0 in all classes, in all tiers.

Viewing Tiers

Disks are originally configured when a system is set up. In most systems, all disks form one pool of storage in a managed disk folder. By default, the managed disk folder is named **Assigned**. Disks of different classifications, such as 15K, 10K, or FATA are all part of the managed disk folder.

Storage Center assigns disks of different classifications to one of three tiers. Tier 1 is the highest performance tier; Tier 3 is the most cost efficient tier.

To view disk tiers

1 From the system tree, select the managed disk folder. Disk tiers appear.

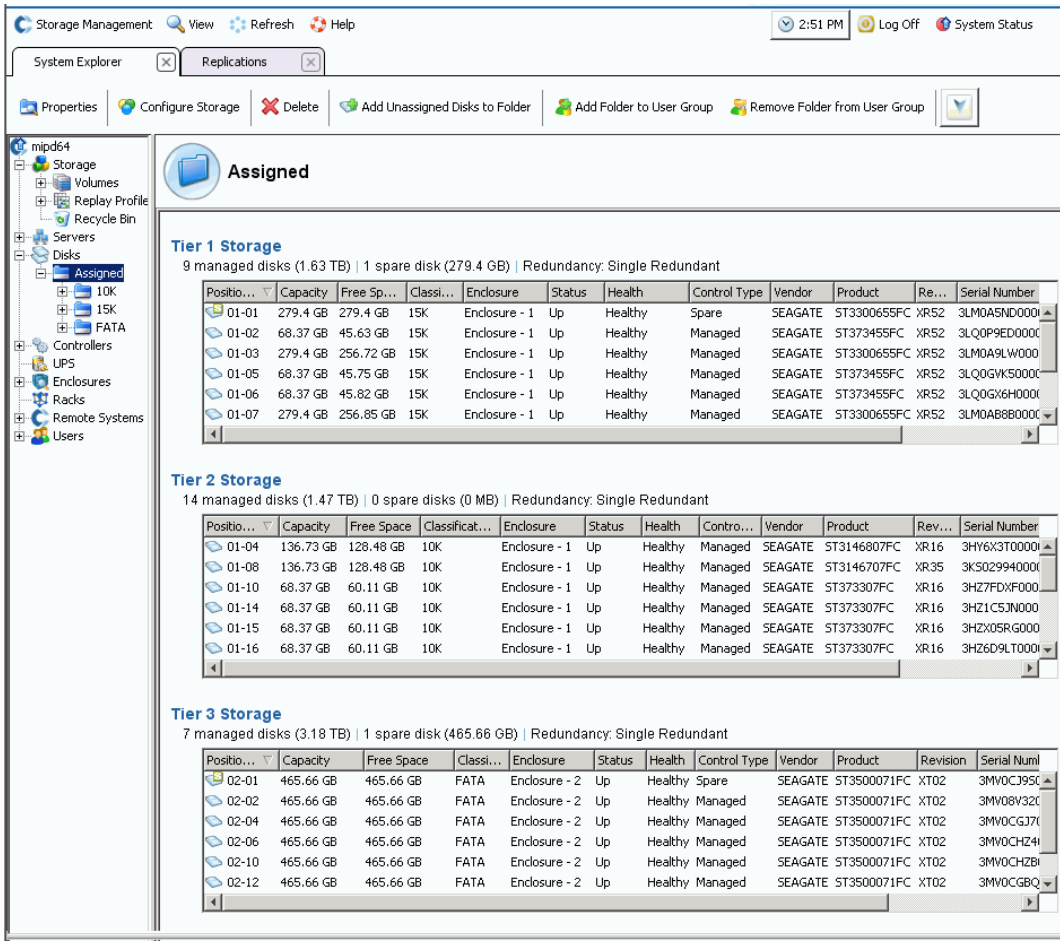


Figure 88. Disk Tiers

Storage Center automatically migrates old data to lower tiers.

Adding Disks to a Storage Center System

As data is written, you will need to add disks or enclosures to the system. The supported maximum number of enclosures attached to a Storage Center system depends on the type of enclosure.

After disks are added to a system, space may not be immediately available. Make sure that you allow enough time for the system to allocate space to use for writes.

Make sure you have disks available in sufficient time to incorporated them into the Storage Center as needed.

To add disks to a Storage Center

1. Install enclosures and disk drives according to the hardware installation manuals, shipped with these units. For more information about adding enclosures, refer to the *Storage Center System Connectivity Guide.*
2. Once disks have been added, from the System Manager Storage Management menu, select **Disk > Scan for Disks**. Storage Center scans for disks.
3. Data cannot be written to unmanaged disks. When disks are added to the Storage Center system, the unmanaged disks appear in the Unassigned disk folder. If there are no unassigned disks, the Unassigned disk folder disappears. An assigned disk folder was created when the system was set up. (Refer to *Storage Center System Setup Guide.*) Managing unassigned disks means to move them into a managed disk folder.

Create a new disk folder only to address specific application requirements. Creating a second disk folder causes storage to be used less efficiently.

4 To manage unassigned disks, select the Disks node.

5 From the shortcut menu, select **Manage Unassigned Disks**. The Manage Unassigned Disks wizard appears. The system displays a list of Unassigned and Foreign Managed disks, if any. Check disks to add to the folder. Use the **Shift** or **Ctrl** key to select multiple disks.

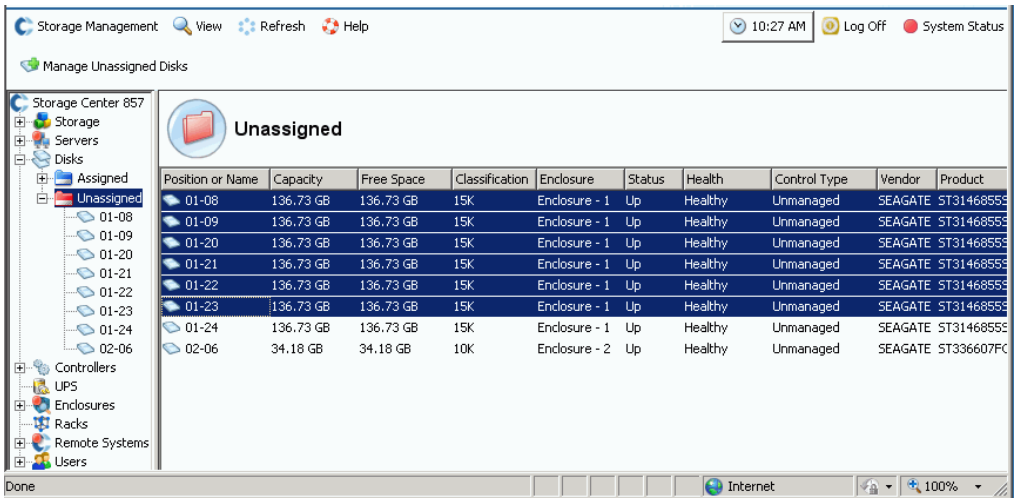

Storage Management
View
Refresh
Help
10:27 AM
Log Off
System Status
Manage Unassigned Disks
Storage Center 857
Storage
Servers
Disks
Assigned
Unassigned
01-08
01-09
01-20
01-21
01-22
01-23
01-24
02-06
Controllers
UPS
Enclosures
Racks
Remote Systems
Users
Unassigned
Position or Name | Capacity | Free Space | Classification | Enclosure | Status | Health | Control Type | Vendor | Product
01-08 | 136.73 GB | 136.73 GB | 15K | Enclosure - 1 | Up | Healthy | Unmanaged | SEAGATE | ST3146855S
01-09 | 136.73 GB | 136.73 GB | 15K | Enclosure - 1 | Up | Healthy | Unmanaged | SEAGATE | ST3146855S
01-20 | 136.73 GB | 136.73 GB | 15K | Enclosure - 1 | Up | Healthy | Unmanaged | SEAGATE | ST3146855S
01-21 | 136.73 GB | 136.73 GB | 15K | Enclosure - 1 | Up | Healthy | Unmanaged | SEAGATE | ST3146855S
01-22 | 136.73 GB | 136.73 GB | 15K | Enclosure - 1 | Up | Healthy | Unmanaged | SEAGATE | ST3146855S
01-23 | 136.73 GB | 136.73 GB | 15K | Enclosure - 1 | Up | Healthy | Unmanaged | SEAGATE | ST3146855S
01-24 | 136.73 GB | 136.73 GB | 15K | Enclosure - 1 | Up | Healthy | Unmanaged | SEAGATE | ST3146855S
02-06 | 34.18 GB | 34.18 GB | 10K | Enclosure - 2 | Up | Healthy | Unmanaged | SEAGATE | ST336607FC
Done
Internet
100%

Figure 89. Select Unmanaged Disks

6 Click **Continue**. If there is a second disk folder, and there should not be, the system asks you to select the folder into which the new disks should be placed. Otherwise, the system displays a list of the disks you selected and asks you to select disks to be designated as hot spares.

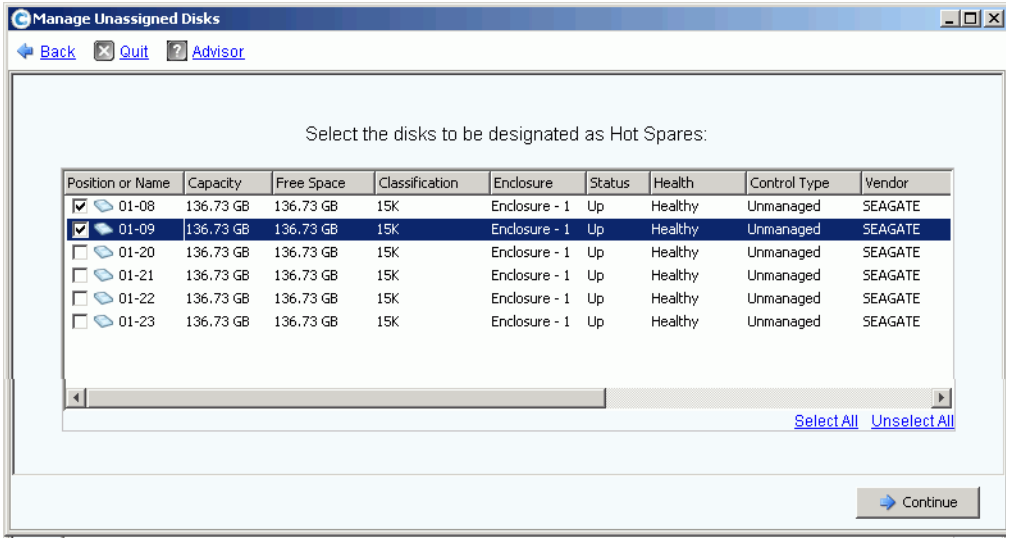

Manage Unassigned Disks
Back
Quit
Advisor
Select the disks to be designated as Hot Spares:
Position or Name | Capacity | Free Space | Classification | Enclosure | Status | Health | Control Type | Vendor
01-08 | 136.73 GB | 136.73 GB | 15K | Enclosure - 1 | Up | Healthy | Unmanaged | SEAGATE
01-09 | 136.73 GB | 136.73 GB | 15K | Enclosure - 1 | Up | Healthy | Unmanaged | SEAGATE
01-20 | 136.73 GB | 136.73 GB | 15K | Enclosure - 1 | Up | Healthy | Unmanaged | SEAGATE
01-21 | 136.73 GB | 136.73 GB | 15K | Enclosure - 1 | Up | Healthy | Unmanaged | SEAGATE
01-22 | 136.73 GB | 136.73 GB | 15K | Enclosure - 1 | Up | Healthy | Unmanaged | SEAGATE
01-23 | 136.73 GB | 136.73 GB | 15K | Enclosure - 1 | Up | Healthy | Unmanaged | SEAGATE
Select All
Unselect All
Continue

Figure 90. Select Hot Spares

7 Select disks to be designated as hot spares. If a disk fails, Storage Center automatically rebuilds the data that was on the failed disk on to the spare disk. Hot spares do not count toward usable storage, but each disk spare adds to the resiliency of your system. Depending on your configuration, select one or more disks as spares.

8 Click **Continue**. The system indicates that the folder will be modified.

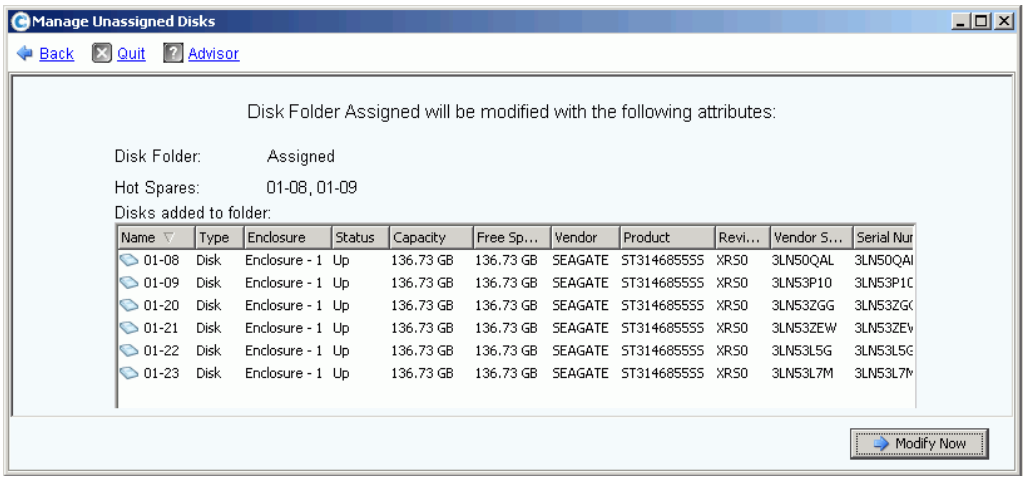

Manage Unassigned Disks
Back
Quit
Advisor
Disk Folder Assigned will be modified with the following attributes:
Disk Folder: Assigned
Hot Spares: 01-08, 01-09
Disks added to folder:
Name | Type | Enclosure | Status | Capacity | Free Sp... | Vendor | Product | Revi... | Vendor S... | Serial Nur
01-08 | Disk | Enclosure - 1 | Up | 136.73 GB | 136.73 GB | SEAGATE | ST314685SSS | XRS0 | 3LN50QAL | 3LN50QAI
01-09 | Disk | Enclosure - 1 | Up | 136.73 GB | 136.73 GB | SEAGATE | ST314685SSS | XRS0 | 3LN53P10 | 3LN53P1C
01-20 | Disk | Enclosure - 1 | Up | 136.73 GB | 136.73 GB | SEAGATE | ST314685SSS | XRS0 | 3LN53ZGG | 3LN53ZGC
01-21 | Disk | Enclosure - 1 | Up | 136.73 GB | 136.73 GB | SEAGATE | ST314685SSS | XRS0 | 3LN53ZEW | 3LN53ZEV
01-22 | Disk | Enclosure - 1 | Up | 136.73 GB | 136.73 GB | SEAGATE | ST314685SSS | XRS0 | 3LN53L5G | 3LN53L5G
01-23 | Disk | Enclosure - 1 | Up | 136.73 GB | 136.73 GB | SEAGATE | ST314685SSS | XRS0 | 3LN53L7M | 3LN53L7M
Modify Now

Figure 91. Assigned Folder Modified

9 Click **Modify Now**. The disks are added to the assigned disk folder. A window allowing you to rebalance RAID devices appears.

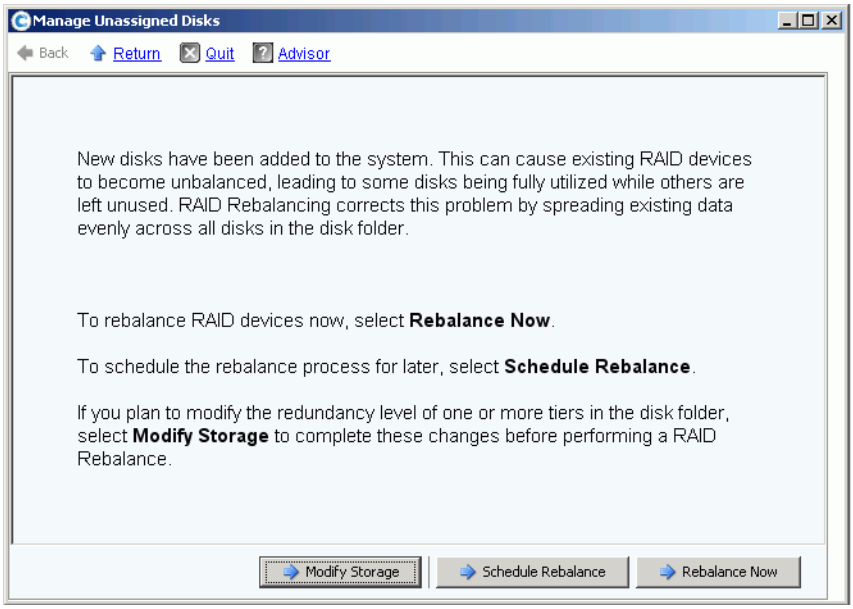

Manage Unassigned Disks
Back
Return
Quit
Advisor
New disks have been added to the system. This can cause existing RAID devices to become unbalanced, leading to some disks being fully utilized while others are left unused. RAID Rebalancing corrects this problem by spreading existing data evenly across all disks in the disk folder.
To rebalance RAID devices now, select Rebalance Now.
To schedule the rebalance process for later, select Schedule Rebalance.
If you plan to modify the redundancy level of one or more tiers in the disk folder, select Modify Storage to complete these changes before performing a RAID Rebalance.
Modify Storage
Schedule Rebalance
Rebalance Now

Figure 92. Manage Disks Rebalance Window

- **Modifying Storage** allows you to configure a redundancy level (dual or single) for each tier of storage within the disk folder. For more information, refer to Configuring Storage on page 120. Be sure to modify storage before you rebalance new disks.
- **Schedule Rebalance** enables you to defer rebalancing until a later time.

- **Rebalance Now** restripes data on to all available disks within a disk folder. Rebalancing runs in the background with low priority. Depending on your system, rebalancing can take as long as several days. However, to fully use all available space, disks must be rebalanced. For more information, refer to Rebalancing RAID on page 122. You can schedule Rebalancing for off-hours. Refer to Scheduling RAID Rebalancing on page 124

Adding Unassigned Disks to a Folder

1. In the system tree, select a disk folder.
2. From the shortcut menu, select **Add Unassigned Disks to Folder**. The system displays a list of unassigned disks.
3. Select disks to be added.
4. Click **Continue**. The system displays the disks you selected.
5. If applicable, select one or more disks to be designated as hot spares.
6. Click **Continue**. The system asks you to confirm.
7. Click **Modify Now**. The disks are added.

Configuring Storage

When the Storage Center system was setup, the system automatically selected redundancy levels depending upon size of disks in the folder. Refer to the *Storage Center 5 System Setup Guide* for more information.

Modify Tier Redundancy

Storage Center 5 adds RAID 6 as an option for tiered storage. Modifying Tier Redundancy requires a RAID Rebalance to be completed. Do not modify tiers unless sufficient free disk space is available within the disk folder. Tier 1 is the highest performance tier, and Tier 3 is the most cost efficient tier.

Modifying Tier Redundancy means to change it from Single Redundant (RAID 10, RAID 5-9, or RAID 5-5) to Dual Redundant (RAID 10 D-M, RAID 6-6, or RAID 6-9). Refer to the Glossary on page 425 for RAID definitions.

To modify storage configuration, do one of the following:

- While adding disks, click **Modify Storage** in the last window of the wizard, as shown in Figure 92 on page 118, or
- Select a disk folder. From the shortcut menu, select **Configure Storage**.

To modify a tier

1 Click the **Modify Tier Redundancy icon** above the tier you want to modify. The Modify Tier Redundancy window appears.

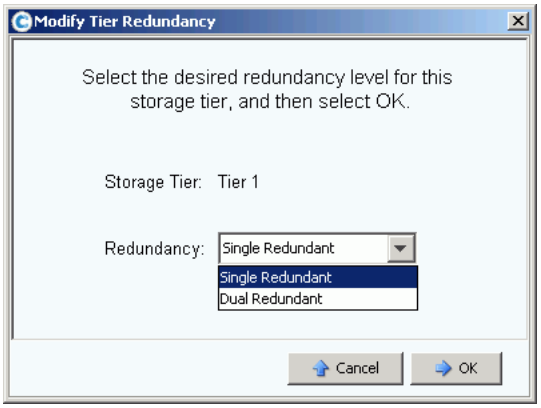


Figure 93. Modify Tier Redundancy

2 Select Single or Dual Redundant. If you change from Single Redundant to Dual Redundant, notice that:

- RAID 5-5 Standard becomes RAID 6-6 Standard
- RAID 5-5 Fast becomes RAID 6-6 Fast (if Fast Track is licensed)
- RAID 5-9 Standard becomes RAID 6-10 Standard
- RAID 5-9 Fast becomes RAID 6-10 Fast (if Fast Track is licensed)
- RAID 10 Standard becomes RAID 10-DM Standard
- RAID 10 Fast becomes RAID 10-DM Fast (if Fast Track is licensed)

3 In the Modify Tier Redundancy window, click **OK**.

4 Repeat for all the tiers you want to modify.

5 Click **OK**.

If any of the modified tiers contain any disks, perform a RAID Rebalance in order to complete the tier redundancy modification.

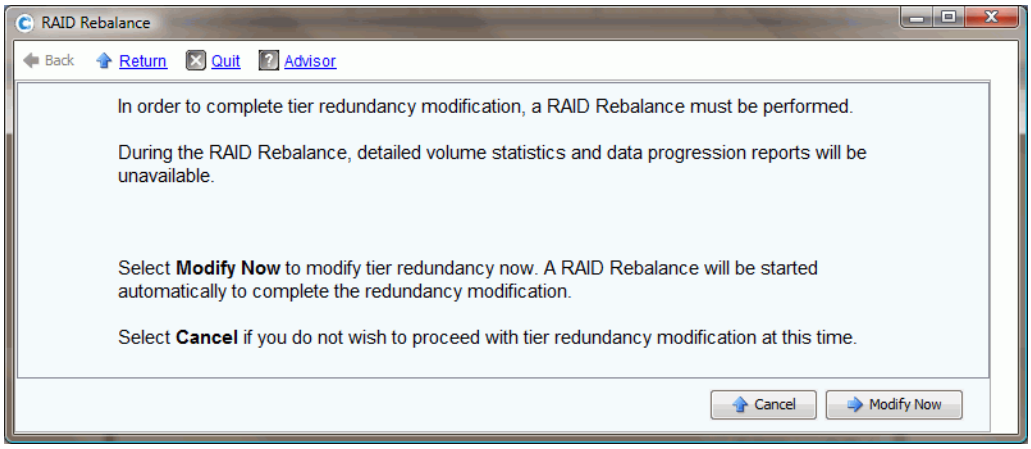

RAID Rebalance
Back
Return
Quit
Advisor
In order to complete tier redundancy modification, a RAID Rebalance must be performed.
During the RAID Rebalance, detailed volume statistics and data progression reports will be unavailable.
Select **Modify Now** to modify tier redundancy now. A RAID Rebalance will be started automatically to complete the redundancy modification.
Select **Cancel** if you do not wish to proceed with tier redundancy modification at this time.
Cancel
Modify Now

Figure 94. Modify Redundancy Rebalance

If the system determines that there is sufficient disk space to rebalance data across drives, a rebalance is started automatically. Refer to Rebalancing RAID on page 122.

If there does not appear to be enough disk space available in the disk folder to allow for a RAID Rebalance, the system asks you to add storage. Refer to Adding Disks to a Storage Center System on page 116.

Removing a Storage Class

Removing a storage class is not recommended.

1 Select the disk folder. From the shortcut menu, select **Configure Storage**.

2 From the resulting window, select a **Storage Class**.

3 Click **Remove Selected Class**. The system warns you that before proceeding with modification, it is advised that you contact Dell Support Services for assistance.

Rebalancing RAID

RAID Rebalancing restripes data to optimize the use of disk space. System Manager distributes data as evenly as possible across disks in a disk folder. Operations such as adding or removing disks or modifying redundancy levels can cause data to be unevenly distributed across disks. The RAID Rebalance process redistributes data. The process also can be used to move data off disks that were moved to another disk folder.

To view RAID rebalance status

1 From the Storage Management menu select **Disk > Rebalance RAID**. The **RAID Rebalance** window appears.

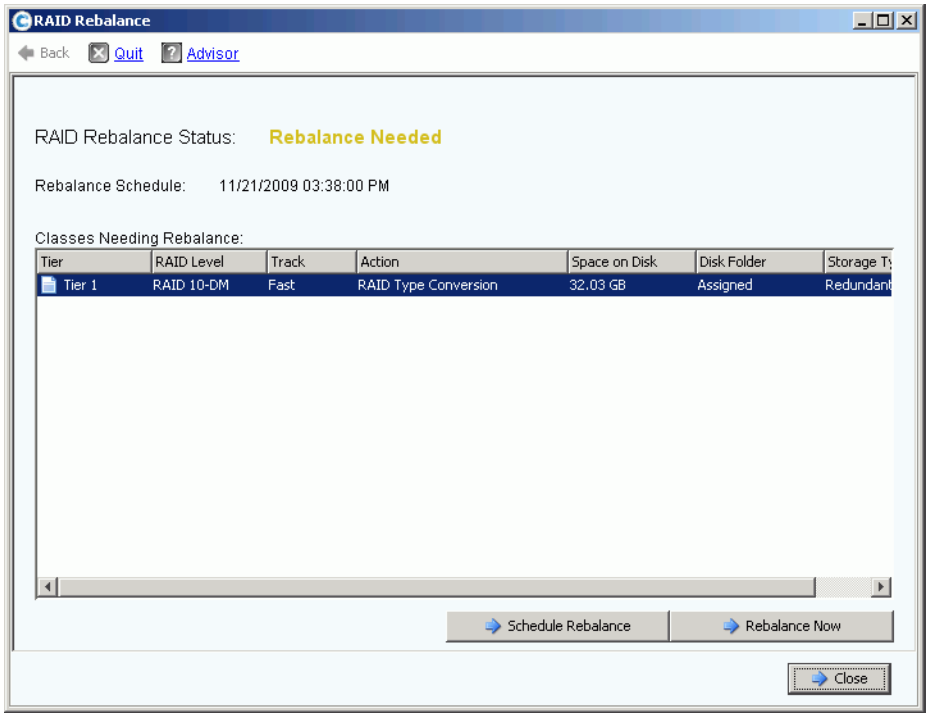


Figure 95. RAID Rebalance Status

2 To rebalance now, click **Rebalance Now**. Otherwise, click **Schedule Rebalance** to rebalance later.

3 While Rebalance is in progress, the RAID Rebalance wizard displays the rebalance progress.

4 Click **Close** if you like, and the System Manager continues to rebalance data in the background. Reopen the **RAID Rebalance** window to monitor rebalance progress by opening the Storage Management menu and selecting **Disk > Rebalance RAID**. To stop Rebalancing, in the **RAID Rebalance** window, click **Stop Rebalancing**.

RAID Rebalance Status

The **Monitor RAID Rebalance** window displays information about the current status of RAID Rebalance. The options available on the **Monitor RAID Rebalance** window change depending upon the RAID Rebalance state.

RAID Rebalance may be in one of the following states:

- **Rebalance Not Needed** - RAID Rebalance is not currently running and no classes of storage report requiring rebalance.
- **Rebalance Needed** - One or more classes of storage on the system reports requiring a rebalance.
- **In Progress** - RAID Rebalance is currently in progress.
- **Final Pass In Progress** - RAID Rebalance is completing its final pass.
- **Rebalance Complete** - RAID Rebalance has been completed successfully.
- **Rebalance Failed** - RAID Rebalance has been performed, but one or more classes of storage still reports requiring a rebalance.
- **Rebalance Stopping** - A user has requested that RAID Rebalance be stopped.
- **Rebalance Stopped** - RAID Rebalance has been stopped prematurely by a user.

RAID Rebalance Options

The following options may appear depending upon the current state of RAID Rebalance:

- **Rebalance Now** - Starts the RAID Rebalance process.
- **Schedule Rebalance** - Allows RAID Rebalance to be scheduled for a later time.
- **Stop Rebalance** - Stops the RAID Rebalance process after the current pass. This may take several minutes.
- **Close** - Closes the **RAID Rebalance** wizard. If a RAID Rebalance is in progress, it will continue in the background until complete.

RAID Rebalance Information

The following information is provided when a RAID Rebalance is in progress:

- **Rebalance Start Time** - The time at which the RAID Rebalance was started.
- **Estimated Completion Time** - The estimated time at which the RAID Rebalance will be completed. This information is not available until the RAID Rebalance has been running for a sufficient amount of time.
- **Percent Complete** - The percent of allocated space which has been rebalanced.
- **Space Remaining** - The amount of space remaining to be rebalanced of the initial amount of space needing rebalance.

Depending upon the amount of data on your system, RAID Rebalancing may take several days or even weeks. RAID Rebalancing moves the lowest scoring RAID Devices first; beginning with the smallest RAID Devices. RAID Rebalancing takes longer when the system is running low on space, or when temporary devices must be created to allow for the replacement of existing devices. RAID Rebalancing has the potential to fail or deadlock when moving some RAID devices. If this occurs, it may be necessary to add more disk space to the system to allow RAID Rebalancing to complete.

Although RAID Rebalancing is a background process, depending on the size and activity of your system, Rebalancing can take weeks. Schedule it accordingly.

Scheduling RAID Rebalancing

To schedule rebalancing to start at a predetermined time such as a weekend or during times of low activity:

1 From the Storage Management menu select **Disk > Rebalance RAID**. The **RAID Rebalance** window appears.

2 Click **Schedule RAID Rebalance**. The following window appears.

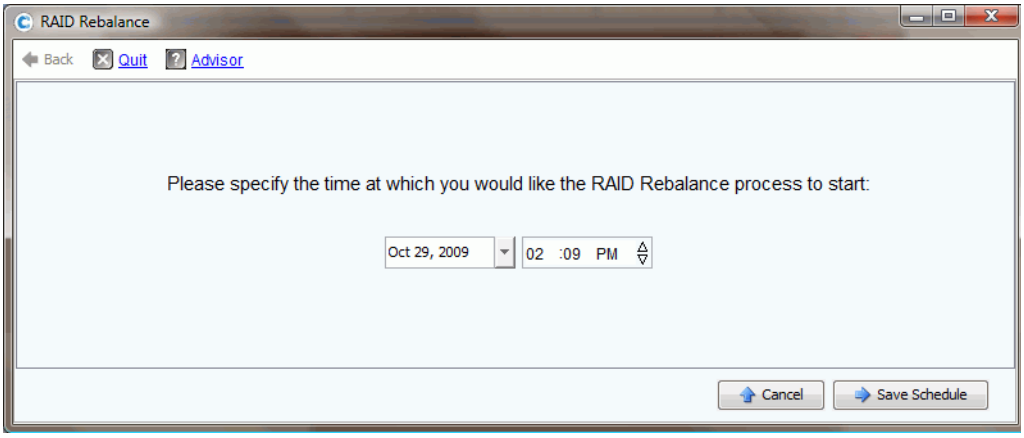


Figure 96. Schedule RAID Rebalancing

3 Enter a date or click the down arrow to view a calendar. Use the up/down arrows to select a time.

4 Click **Save Schedule**.

To view a scheduled rebalance

To view a RAID Rebalance scheduled in the future, from the **View** menu, choose **Scheduled Events**. The RAID Rebalance appears as a scheduled event.

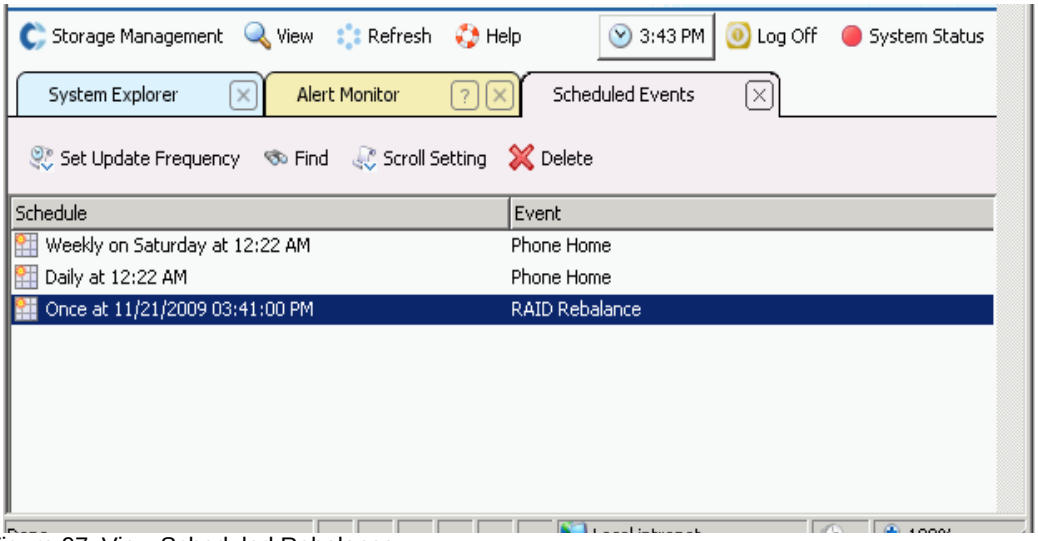


Figure 97. View Scheduled Rebalance

To delete a scheduled rebalance

To delete a scheduled RAID Rebalance:

1. From the **View** menu, choose **Scheduled Events**. The RAID Rebalance appears as a scheduled event.
2. Select the **Rebalance** event.
3. From the shortcut menu, choose **Delete**. The system asks you to confirm.
4. Click **Yes**.

Managing Disks

A folder that contains managed disks was created when the system was set up. In the system tree, select a disk. General disk information appears.

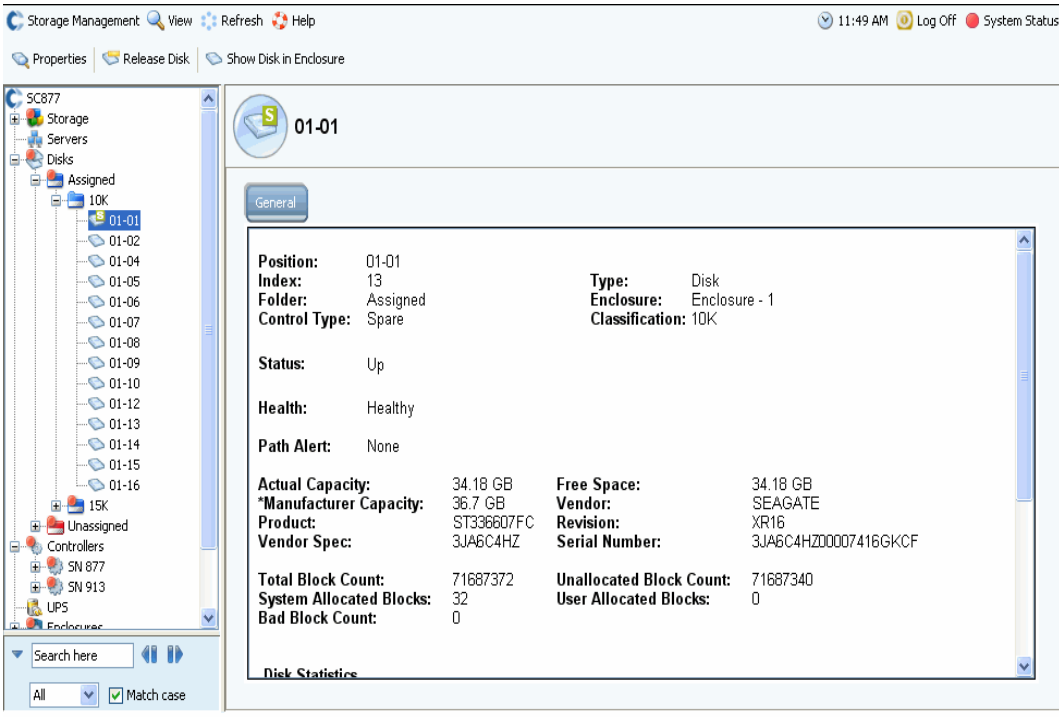


Figure 98. General Disk Information

Information in this window includes:

- **Position**: listed as enclosure and position. For example, disk 01-06 resides in Enclosure 1. To view the position of this disk in an enclosure, select a disk. From the shortcut menu, select **Show Disk in Enclosure**. The command displays the physical location of the disk.
- **Index**: Number required by Dell Support Services to assist with component identification.
- **Folder**: The disk folder in which this disk resides
- **Control Type**: A disk can be one of following types:
  - **Managed:** Part of a managed disk folder. Data is striped across all drives in a managed disk folder (except reserved hot spares). To move a managed disk, refer to Moving a Managed Disk on page 127.
  - **Unmanaged**: A disk that is recognized by Storage Center but has not yet been assigned to a managed disk folder. An unmanaged disk cannot store data. To add an unmanaged disk to a managed disk folder, refer to Adding Disks to a Storage Center System on page 116 or Adding Unassigned Disks to a Folder on page 119.
  - **Foreign Managed**: A disk that is recognized by this Storage Center system but not managed by it. A Foreign Managed disk could have been managed previously by another Storage Center system or another manufacturer. When the disk is assigned, it becomes Managed.

  - **Spare:** A disk that is used for redundancy.
- **Type**: Object type is Disk.
- **Enclosure**: Enclosures are installed and numbered starting at the bottom of a rack.
- **Classification**: Type of disk, such as 7K, 10K, 15K, and SSD.
- **Status**: Up or Down.
- **Health**: Healthy or Unhealthy.
- **Path Alert**: Either none or alert text, such as: “Disk 5 only one path to device.”
- **Actual Capacity**, **Free Space**, and **Manufacturer Capacity**.
- **Vendor**, **Product**, **Revision**, **Vendor Spec**, and **Serial Number**.
- **Block Count**: **Total, Unallocated**, **System Allocated**, **User Allocated**, and **Bad**.
- **Disk Statistics**: Number of Read requests, blocks and errors; Number of Write requests, blocks, and errors.
- **Date Detected**: The date and time the system detected the disk. Date Updated: Date and time a user last modified or managed the disk.

Note To classify a disk as an external device, refer to Classify Disk as External Device on page 133.

Alerting When One Path is Available

By default, disks have two paths to the controller. If one path is disconnected, a port fails, or a path is mis-cabled, the controller has only one path to the disk. This is a single point of failure. Make sure you are alerted if only one path remains to a disk. However, if you are reconfiguring a system and deliberately changing paths, you may not need an alert for all disks with one path.

To set a path disconnected alert

1 In the system tree, select a disk.

1 From the shortcut menu, select **Properties**. The system displays the **Disk Properties** window for that disk. In the **Disk Properties** window, select or clear **Alert When Only One Path is Available**.

2 In the Info tab, enter any notes (up to 255 characters).

3 Click **OK**.

Moving a Managed Disk

Never move managed disks without direct Dell Support Services intervention.

When one or more disks are moved out of a folder, data in the folder is restriped on the remaining disks. For this reason, you cannot move disks out of a folder unless the remaining disks have enough free space to accommodate re-striping the data. Also, for this command to appear, you must have a second disk folder to move the disks to.

To move a managed disk from one disk folder to another

1. In the system tree, select a disk.
2. From the shortcut menu, select **Move Managed Disk**. The **Move Managed Disk** window appears.
3. Select a folder to which you want to move the managed disks. Alternately, you can create a new folder. See Creating a Disk Folder on page 131.)
4. Click **Continue**. The system asks you to confirm.
5. Click **Yes (Move Now)**. You may have to refresh the browser before the disk appears in the new folder.
6. The system asks you to rebalance the data on the disk. For more information on rebalancing, refer to Rebalancing RAID on page 122

Releasing Disks

Releasing a disk removes it from the disk folder. You can only release a disk that contains no user data. You can always release a spare disk.

To release a disk from a folder

1. In the system tree, select a disk to be released. **The Disk Information** window appears. Notice **User Allocated Blocks**. If the User Allocated Blocks field shows a count more than 0:
   a. Move the disk to another folder. Refer to Moving a Managed Disk on page 127. Make sure that you have a folder to which to move the disk and that there is enough free space on the remaining disks in the folder to move the data. If necessary, create a disk folder as described on Creating a Disk Folder on page 131.
   b. Rebalance the data among the disks remaining in the managed folder (as described in Rebalancing RAID on page 122). Because rebalancing data occupies system resources, you can rebalance immediately or schedule rebalancing for low-use hours.
2. When the user-allocated block count is 0, from the shortcut menu, select **Release Disks**. The user-allocated block is reduced to 0 only if there is enough space on the remaining disks in the disk folder to accommodate the movement of data off that disk.
3. Click **Yes** to release the disk to the unassigned folder. The disk is released.

Deleting Disks

You cannot delete a disk unless it has failed and has no user allocated blocks or the disk has been released. In the System Explorer window, a failed disk appears with a red dot. In the Disk Information window status is reported as down and health is reported as failed.

To delete a failed or released disk

1. In the Storage Management tree, select a disk.
2. From the shortcut menu, select **Delete Disk**.

- If the disk is not down or is carrying User Allocated Blocks, System Manager warns you that the disk cannot be removed.
- If the disk has failed or has no User Allocated Blocks, System Manager asks you to confirm the deletion.

3 Click **Yes**. The system deletes the disk from the folder and closes the window. You can now physically remove the disk from the system.

Showing Placement of a Disk in an Enclosure

1 In the system tree, select a disk.

2 From the shortcut menu, select **Show Disk in Enclosure**. System Manager switches to the physical view and the disk is displayed.

Managed Disk Folders

Viewing the Assigned Disk Folder

Disks were assigned to a managed disk folder when the Storage Center was set up. By convention, the managed disk folder is named Assigned.To view the assigned disk folder, in the system tree, expand Disks. System Manager groups disks into tiers by disk type, with the capacity, spare capacity, and redundancy level of each tier.

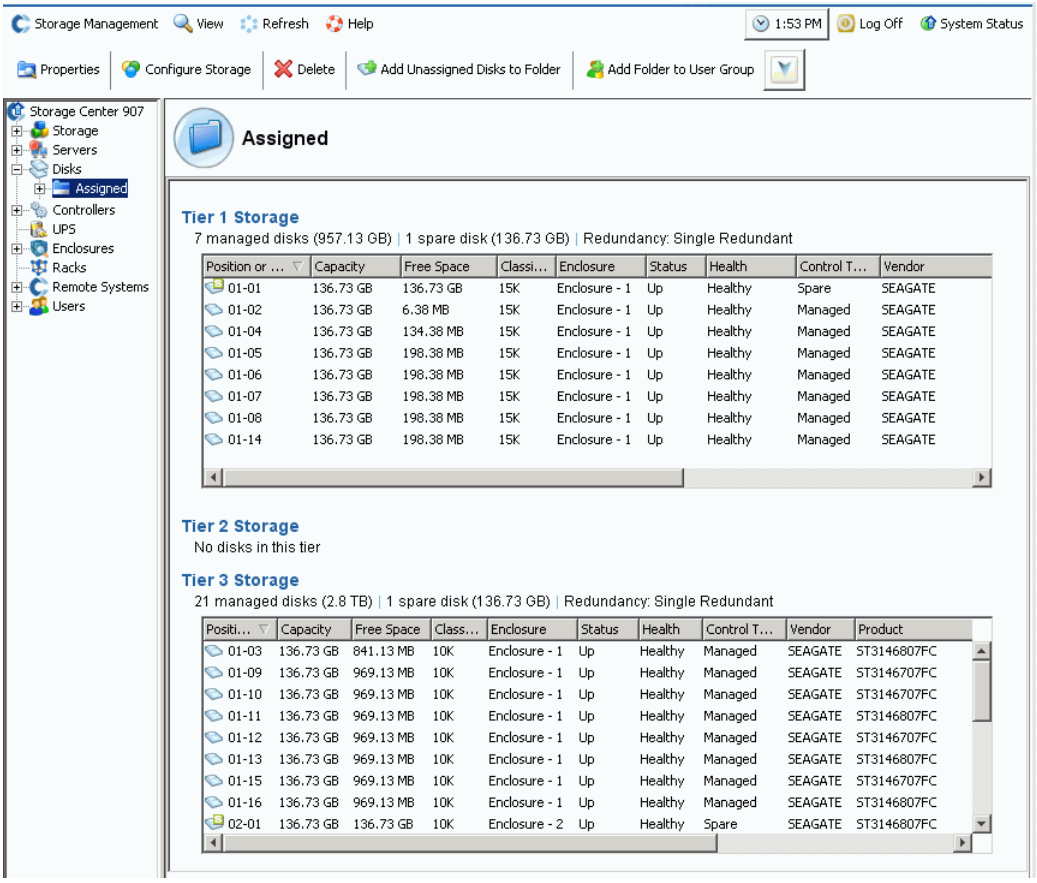

Storage Management
View
Refresh
Help
1:53 PM
Log Off
System Status
Properties
Configure Storage
Delete
Add Unassigned Disks to Folder
Add Folder to User Group
Storage Center 907
Storage
Servers
Disks
Assigned
Controllers
UPS
Enclosures
Racks
Remote Systems
Users
Assigned
Tier 1 Storage
7 managed disks (957.13 GB) | 1 spare disk (136.73 GB) | Redundancy: Single Redundant
Position or ... | Capacity | Free Space | Classi... | Enclosure | Status | Health | Control T... | Vendor
01-01 136.73 GB 136.73 GB 15K Enclosure - 1 Up Healthy Spare SEAGATE
01-02 136.73 GB 6.38 MB 15K Enclosure - 1 Up Healthy Managed SEAGATE
01-04 136.73 GB 134.38 MB 15K Enclosure - 1 Up Healthy Managed SEAGATE
01-05 136.73 GB 198.38 MB 15K Enclosure - 1 Up Healthy Managed SEAGATE
01-06 136.73 GB 198.38 MB 15K Enclosure - 1 Up Healthy Managed SEAGATE
01-07 136.73 GB 198.38 MB 15K Enclosure - 1 Up Healthy Managed SEAGATE
01-08 136.73 GB 198.38 MB 15K Enclosure - 1 Up Healthy Managed SEAGATE
01-14 136.73 GB 198.38 MB 15K Enclosure - 1 Up Healthy Managed SEAGATE
Tier 2 Storage
No disks in this tier
Tier 3 Storage
21 managed disks (2.8 TB) | 1 spare disk (136.73 GB) | Redundancy: Single Redundant
Positi... | Capacity | Free Space | Class... | Enclosure | Status | Health | Control T... | Vendor | Product
01-03 136.73 GB 841.13 MB 10K Enclosure - 1 Up Healthy Managed SEAGATE ST3146807FC
01-09 136.73 GB 969.13 MB 10K Enclosure - 1 Up Healthy Managed SEAGATE ST3146707FC
01-10 136.73 GB 969.13 MB 10K Enclosure - 1 Up Healthy Managed SEAGATE ST3146707FC
01-11 136.73 GB 969.13 MB 10K Enclosure - 1 Up Healthy Managed SEAGATE ST3146807FC
01-12 136.73 GB 969.13 MB 10K Enclosure - 1 Up Healthy Managed SEAGATE ST3146707FC
01-13 136.73 GB 969.13 MB 10K Enclosure - 1 Up Healthy Managed SEAGATE ST3146807FC
01-15 136.73 GB 969.13 MB 10K Enclosure - 1 Up Healthy Managed SEAGATE ST3146707FC
01-16 136.73 GB 969.13 MB 10K Enclosure - 1 Up Healthy Managed SEAGATE ST3146807FC
02-01 136.73 GB 136.73 GB 10K Enclosure - 2 Up Healthy Spare SEAGATE ST3146807FC

Figure 99. Assigned Disk Folder

This window is display only. The name of the folder appears at the top of the window. Information in this window includes: Capacity, Free Space, Classification (such as 7K, 10K, 15K, or SSD), Enclosure, Status, Health, and Control Type (such as managed or spare). For optimal performance, assign all disks to one folder.

Disk Folder Properties

Folder properties are available only for local, managed disk folders. No folder properties are available for the Unassigned or External Device folders.

To view disk folder properties

1 In the system tree, select a disk folder, such as Assigned.

2 From the shortcut menu, select **Properties**. The **Disk Folder Properties** window appears.

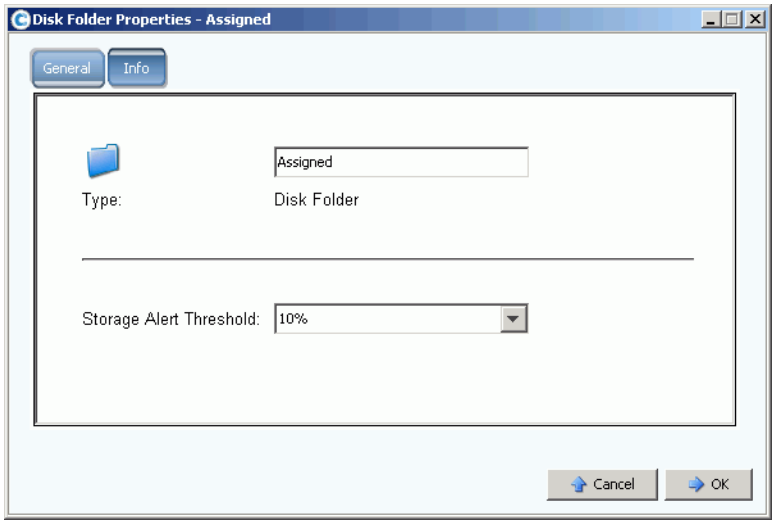


Figure 100. Disk Folder Properties

- To change the folder name, enter a new folder name. Click **OK**.
- To set the Storage Alert Threshold, refer to Phoning Home on page 241.
- To view information about the folder, such as when it was created and by whom, click Info.

Creating a Disk Folder

A managed disk folder was created during installation and setup. A system should have only one folder of managed disks. If additional disks are added to the system, they should be added to the managed disk folder. Unassigned disks appear in the Unassigned Disk folder.

Because Data Progression does not migrate storage across disk folders, a second disk folder impacts the ability of Storage Center to maximize performance. Only in rare circumstances do the benefits of multiple disk folders outweigh the disadvantages.

To create a disk folder

1 From the Storage Management menu, choose **Disk > Folder > Create Disk Folder**. The Create Disk Folder wizard appears. If a disk folder already exists, the Create Disk Folder window asks if you are sure you want to create a second disk folder.

2 Click **Yes**. System Manager displays unassigned disks to be added to the new folder. Only unassigned disks can be added to a disk folder.

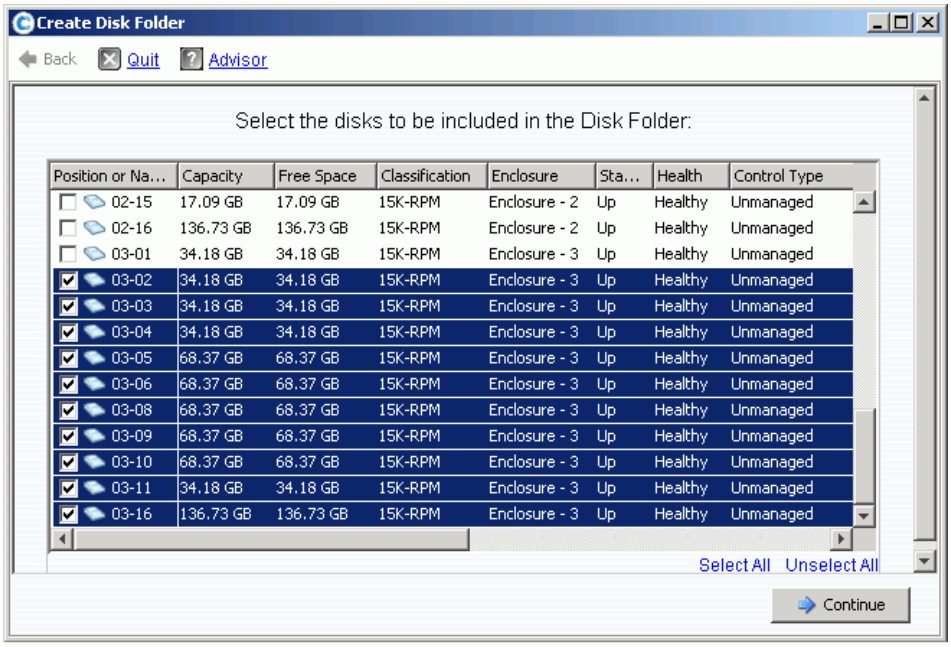

Create Disk Folder
Back
Quit
Advisor
Select the disks to be included in the Disk Folder:
Position or Na...
Capacity
Free Space
Classification
Enclosure
Sta...
Health
Control Type
02-15 17.09 GB 17.09 GB 15K-RPM Enclosure - 2 Up Healthy Unmanaged
02-16 136.73 GB 136.73 GB 15K-RPM Enclosure - 2 Up Healthy Unmanaged
03-01 34.18 GB 34.18 GB 15K-RPM Enclosure - 3 Up Healthy Unmanaged
03-02 34.18 GB 34.18 GB 15K-RPM Enclosure - 3 Up Healthy Unmanaged
03-03 34.18 GB 34.18 GB 15K-RPM Enclosure - 3 Up Healthy Unmanaged
03-04 34.18 GB 34.18 GB 15K-RPM Enclosure - 3 Up Healthy Unmanaged
03-05 68.37 GB 68.37 GB 15K-RPM Enclosure - 3 Up Healthy Unmanaged
03-06 68.37 GB 68.37 GB 15K-RPM Enclosure - 3 Up Healthy Unmanaged
03-08 68.37 GB 68.37 GB 15K-RPM Enclosure - 3 Up Healthy Unmanaged
03-09 68.37 GB 68.37 GB 15K-RPM Enclosure - 3 Up Healthy Unmanaged
03-10 68.37 GB 68.37 GB 15K-RPM Enclosure - 3 Up Healthy Unmanaged
03-11 34.18 GB 34.18 GB 15K-RPM Enclosure - 3 Up Healthy Unmanaged
03-16 136.73 GB 136.73 GB 15K-RPM Enclosure - 3 Up Healthy Unmanaged
Select All
Unselect All
Continue

Figure 101. Create Disk Folder

3 From the list of unmanaged disks, select disks to be included in the new disk folder.

Note The redundancy level of each disk tier is selected automatically based upon the size of disks in the tier. By default, dual redundancy is selected for any tier with a drive greater than 900GB in size.

4 Click **Continue**. System Manager displays the disks you selected, and asks you to choose one or more disks to be a hot spare. The hot spare can replace a failing disk. The spare must be as large as the largest disk in the folder so that it can replace any disk. By default, if there are disks of differing sizes, Storage Center selects the largest disk, or one of them. You cannot create a disk folder without a spare.

5 Click **Continue**. Enter a folder name. Enter any notes (up to 255 characters).

6 Click **Create Now**. The Folder is created.

Deleting a Disk Folder

Before a disk folder can be deleted, it must be empty of disks. Release or delete all disks within a folder before you delete the disk folder.

To delete a disk folder

1 In the system tree, select a disk folder.

2 From the shortcut menu, select **Delete**. System Manager asks you to confirm. Click **Yes**.

Importing from External Device without Replication License

Storage Center allows you to do a thin import from a non-Storage Center disk even if Replication is not licensed. Import from External Device uses synchronous replication to import/load data from a non-Storage Center device. Previously, this was only allowed when synchronous replication was licensed.

Note If Synchronous Replication is not licensed, you cannot import from remote Storage Center volumes. Remote Systems do not appear in the System Tree.

Classify Disk as External Device

A disk can only be classified as an External Device if it is unmanaged. Refer to Adding Disks to a Storage Center System on page 116.

To classify a disk as an external device

1 In the System Tree, select an unmanaged disk.

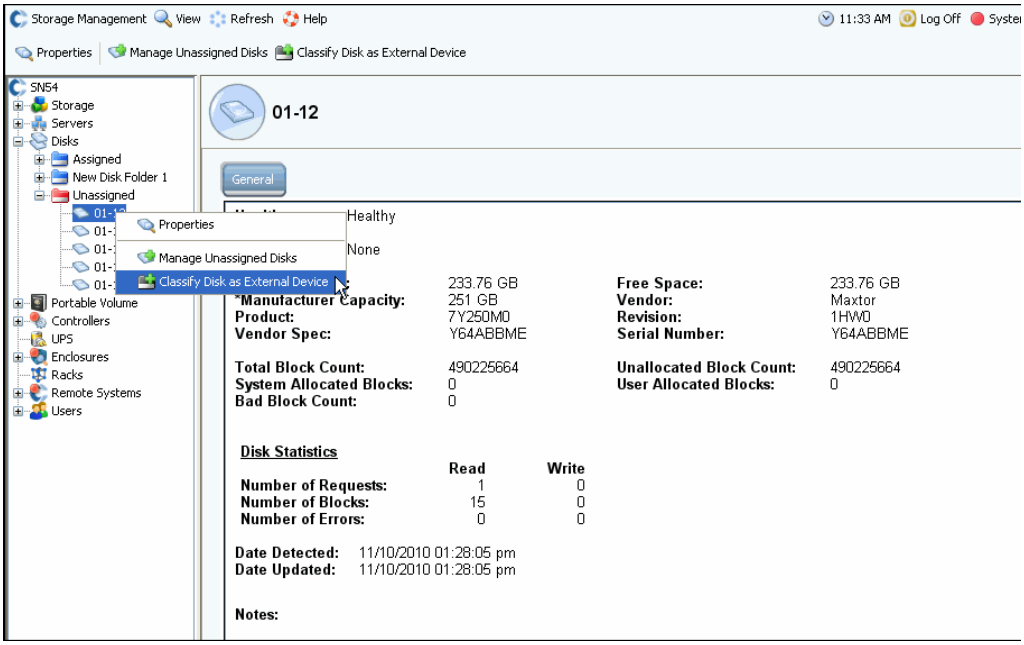


Figure 102. Select Unmanaged Disk

2 From the shortcut menu, select **Classify Disk as External Device**. The **Classify Disk as External Device** window appears.

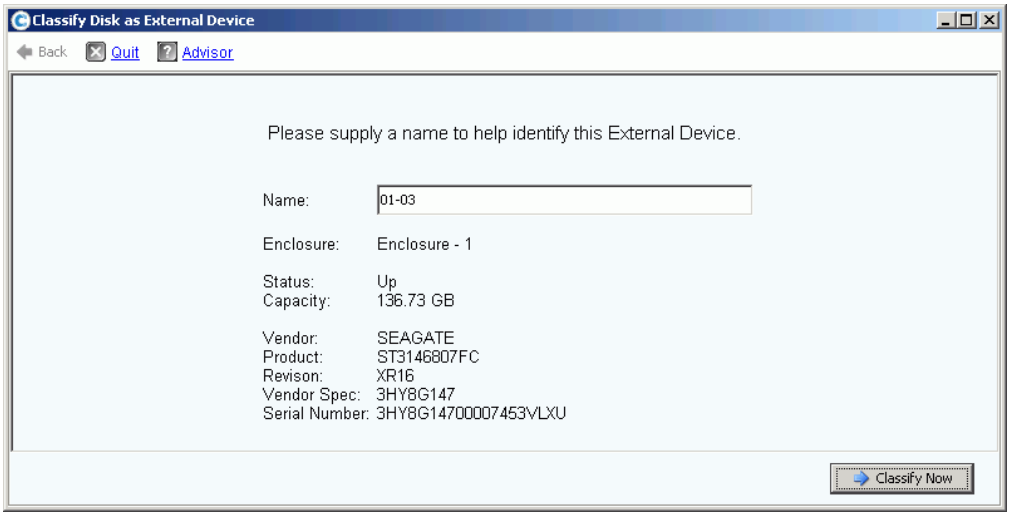


Figure 103. Name External Device

3 Enter a name. You may choose to name this disk to indicate from where the data was imported.

4 Click **Classify Now**. The external device appears in the system tree in an External Device Folder.

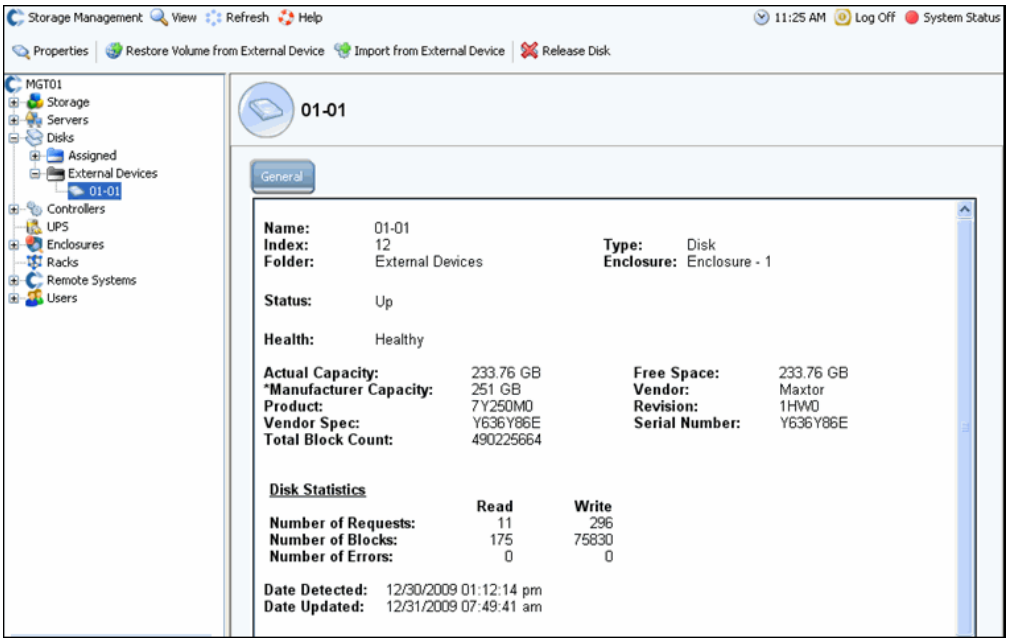


Figure 104. External Device Folder

Import from External Device

1 In the System Tree, open the External Device folder to view disks classified as external devices.

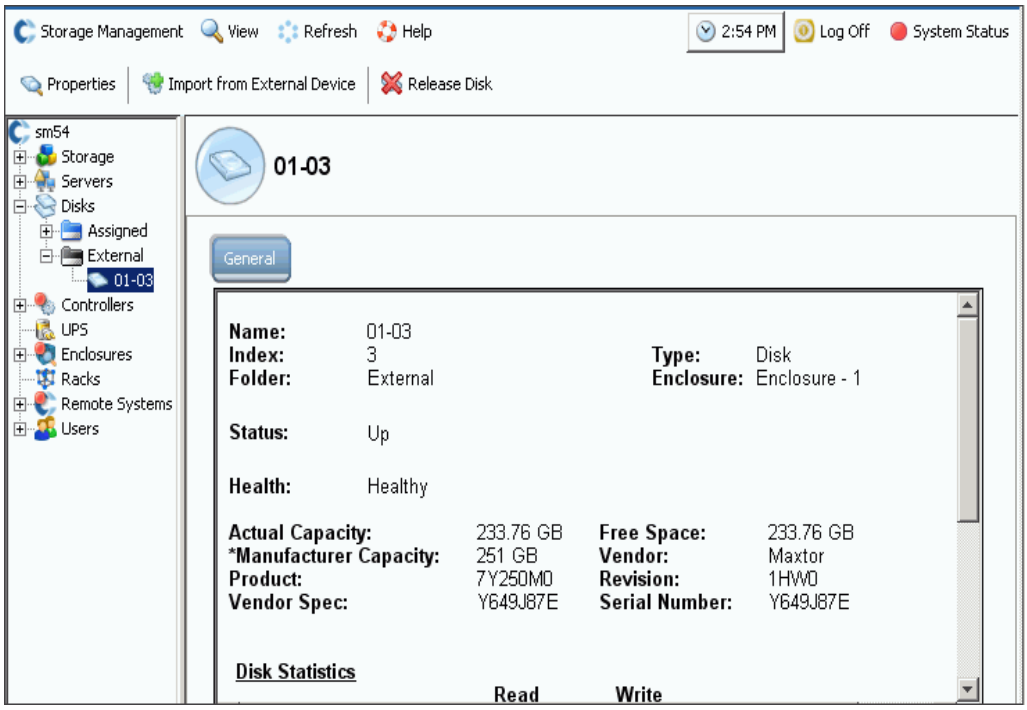


Figure 105. Select External Disk

2 From the shortcut menu, select **Import from External Device**. The system warns you that you must have sufficient space on the Storage Center system to import from an external device.

Note Importing data from an external device requires the Storage Center to read all blocks to the entire size of the volume. Depending on RAID selection this may consume up to two times the storage of the volume on your system.

Thin import works by not writing data if no previous page exists for the data in question, and the data being written is all zeros. This saves significant space for many sparse data sets.

If you have sufficient space, click **Continue**. Select an existing volume or create a new volume to be the destination volume for the remote volume. To create a volume, refer to Creating a Volume on page 67.

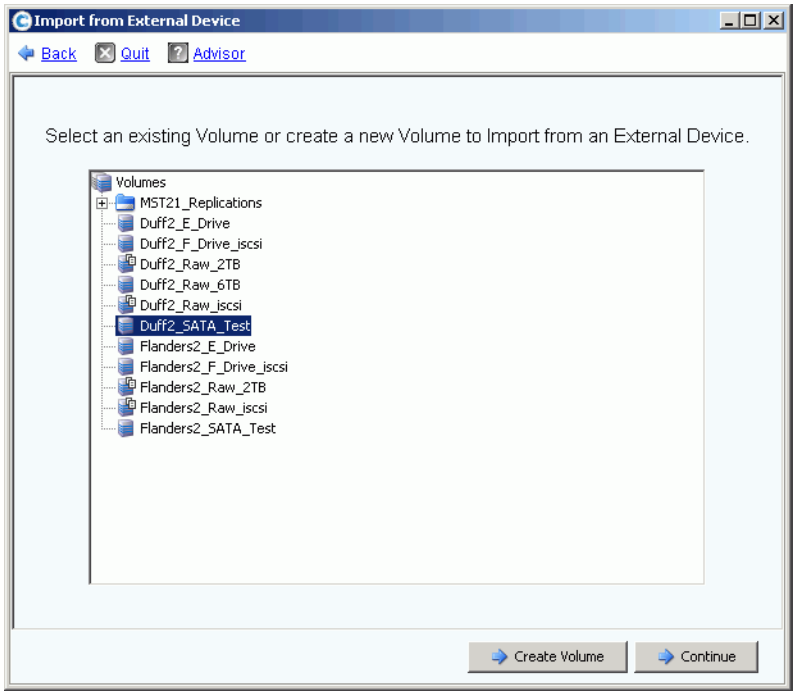


Figure 106. Select Destination Volume

3 Click **Continue**. A Confirmation window appears. The QoS definition (which is required with a Replication license) appears as **Local**.

4 Click **Import Now**.

5 To view the progress of the import, select the destination volume. Notice the Progress Details.

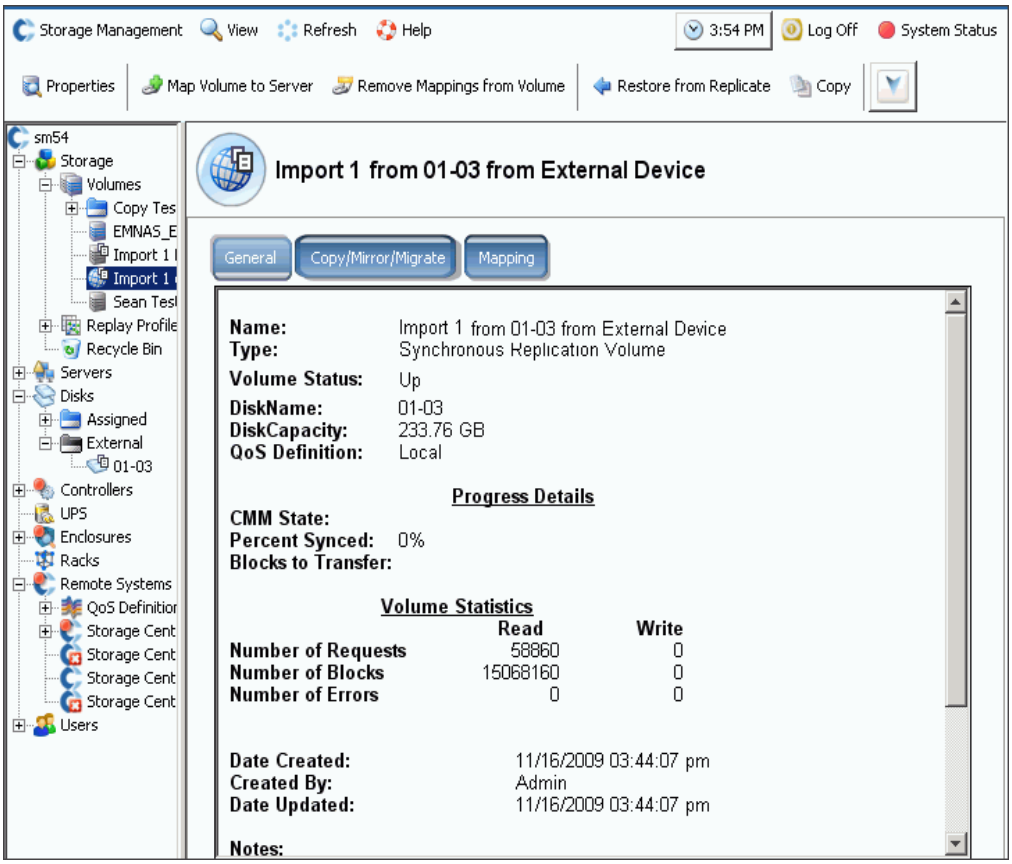


Figure 107. Import Destination Volume

6 Click the **Copy/Mirror/Migrate** tab for additional details.

Non-Standard Storage Types

Advanced storage options allow you to prepare a disk folder for non-standard Storage Types.

Note You can prepare a disk folder for a non-standard Storage Type only if User Volume Defaults permit you to do so. See User Volume Defaults - Advanced on page 274.

To add an option to create a volume with non-standard storage types

1 Select a disk folder, such as **Assigned**.

2 From the shortcut menu, select **Configure Storage**. The System Manager displays the types of storage for which this folder is primed.

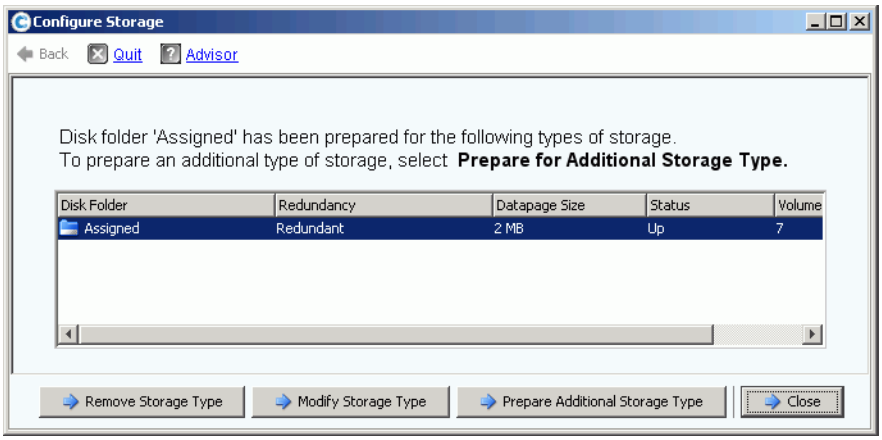


Figure 108. Modify Storage

3 Click **Prepare for Additional Storage Type**. Because additional Storage Types decrease the efficiency of Data Progression, the system warns you that additional storage types are inefficient.

4 Click Y**es (Prepare Now)**. The Select Redundancy window appears.

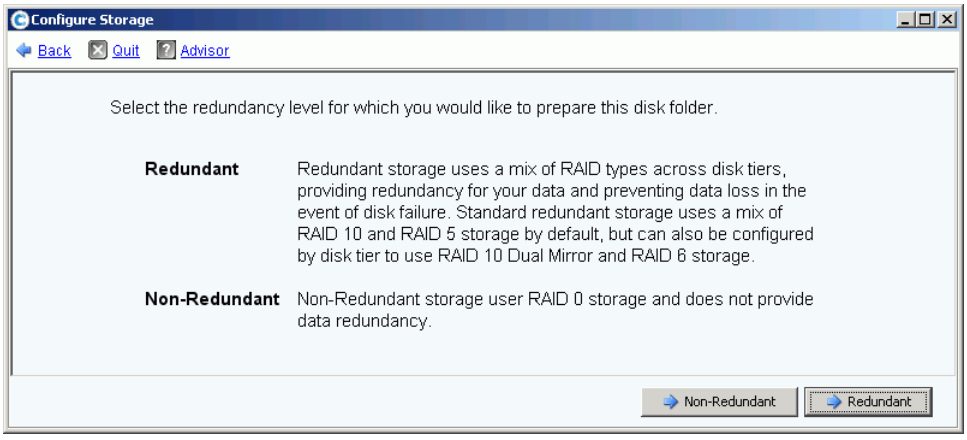

Configure Storage
Back
Quit
Advisor
Select the redundancy level for which you would like to prepare this disk folder.
Redundant
Redundant storage uses a mix of RAID types across disk tiers, providing redundancy for your data and preventing data loss in the event of disk failure. Standard redundant storage uses a mix of RAID 10 and RAID 5 storage by default, but can also be configured by disk tier to use RAID 10 Dual Mirror and RAID 6 storage.
Non-Redundant
Non-Redundant storage user RAID 0 storage and does not provide data redundancy.
Non-Redundant
Redundant

Figure 109. Select Redundancy Window

5 Select **Non-Redundant** or **Redundant**.

- **Non-Redundant** storage uses RAID 0. Data is striped but provides no redundancy. If one disk fails, all data is lost. Do not use non-redundant storage for a volume unless the data is backed-up elsewhere.
- **Redundant** storage may be either Single Redundant or Dual Redundant, depending upon your tier redundancy configuration and disk size. For disks that are 900GB or greater in size, that tier and all tiers below it default to dual redundant storage.
- Single-redundant storage protects against the loss of any one drive.
  - RAID 10 (each disk is mirrored)
  - RAID (5-5 striped across 5 drives)
  - 5-9 (striped across 9 drives)
- Dual-redundant storage protects against the loss of any two drives:
  - RAID 10 Dual-Mirror (data is written simultaneously to three separate disks.)
  - RAID 6-6 (4 data segments, 2 parity segments per stripe)
  - RAID 6-10 (8 data segments, 2 parity segments per stripe)

6 Select the datapage size to be used. It is recommended that you only prepare a disk folder for a single datapage size to optimize disk utilization and I/O performance. Only prepare for additional types of storage to address specific application needs.

- **2 MB:** The default datapage size, this selection is appropriate for most application needs.
- **512 KB:** This datapage size is appropriate for applications with high performance needs, or environments in which Replays are taken frequently under heavy I/O. Selecting this size reduces the amount of space the System Manager can present to servers.
- **4 MB:** This datapage size is appropriate for systems that use a large amount of disk space with infrequent Replays.

Caution If you are considering using either the 512 KB or 4 MB datapage setting, contact Dell Support Services so that system resources remain balanced and the impact on performance is considered.

7 Click **Prepare Now**. The disk folder is prepared for the selected type of storage. It is not used until a volume is created with that Storage Type. The System Manager asks if you want to **Prepare for Additional Storage Type** or **Close**.

8 Click **Close**.

Modifying a Storage Type

Note You can modify a non-standard Storage Type only if your User Volume Defaults permit you to do so.

1 In the **Configure Storage** window shown in Figure 108 on page 138, select **Modify Storage Type**. The **Modify Storage Type** window appears.

2 Select a storage class. Do one of the following:

- Click **Modify Storage Class**. Refer to Modify Tier Redundancy on page 120
- Click **Remove**. Removing a class of storage which is currently in use will result in data being moved to a different storage class. Do not remove classes of storage already in use. The Remove option will only appear if the Allow Storage Class Removal option is selected in the user defaults screen.

3 Select **Continue** to return to the storage type selection screen.

Removing a Storage Type

You can only remove a Storage Type if there are no volumes using the selected type of storage. To remove a Storage Type:

1 Select a disk folder, such as **Assigned**.

2 From the shortcut menu, select **Configure Storage**. The System Manager displays the types of storage for which this folder is primed.

3 Select the Storage Type you want to remove. Click **Remove Storage Type**. The System Manager removes the Storage Type. The Configure Storage window reappears.

4 Click **Close**.

6 Controllers

Introduction 142
About Controller Virtual Ports 143
Viewing Controller Properties 144
Viewing FC Folders and Cards 150
Viewing iSCSI Cards 159
Creating a Remote Storage Center Connection 173
Configuring Remote Connections Using CHAP 181
Viewing SAS Cards 190
Rebalancing Local Ports 194

Introduction

System Alerts notify you of a condition that you must address. A red circle over a controller icon indicates that some component within the controller needs attention.

The Alert button next to System Status at the top of the screen notifies you that a component needs attention. Click **System Status,** in the upper right of the window, to open the Alert Monitor.

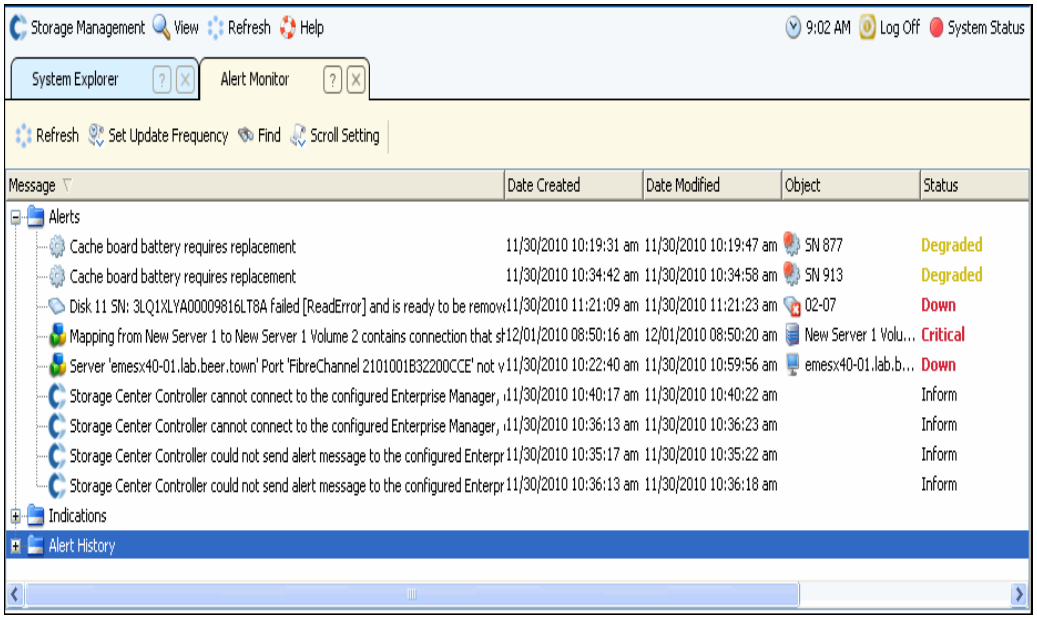

Storage Management
View
Refresh
Help
9:02 AM
Log Off
System Status
System Explorer
Alert Monitor
Refresh
Set Update Frequency
Find
Scroll Setting
Message
Date Created
Date Modified
Object
Status
Alerts
Cache board battery requires replacement 11/30/2010 10:19:31 am 11/30/2010 10:19:47 am SN 877 Degraded
Cache board battery requires replacement 11/30/2010 10:34:42 am 11/30/2010 10:34:58 am SN 913 Degraded
Disk 11 SN: 3LQ1XLYA00009816LT8A failed [ReadError] and is ready to be remov 11/30/2010 11:21:09 am 11/30/2010 11:21:23 am 02-07 Down
Mapping from New Server 1 to New Server 1 Volume 2 contains connection that sh 12/01/2010 08:50:16 am 12/01/2010 08:50:20 am New Server 1 Volu... Critical
Server 'emesx40-01.lab.beer.town' Port 'FibreChannel 2101001B32200CCE' not v 11/30/2010 10:22:40 am 11/30/2010 10:59:56 am emesx40-01.lab.b... Down
Storage Center Controller cannot connect to the configured Enterprise Manager, 11/30/2010 10:40:17 am 11/30/2010 10:40:22 am Inform
Storage Center Controller cannot connect to the configured Enterprise Manager, 11/30/2010 10:36:13 am 11/30/2010 10:36:23 am Inform
Storage Center Controller could not send alert message to the configured Enterpr 11/30/2010 10:35:17 am 11/30/2010 10:35:22 am Inform
Storage Center Controller could not send alert message to the configured Enterpr 11/30/2010 10:36:13 am 11/30/2010 10:36:18 am Inform
Indications
Alert History

Figure 110. Alert Monitor

Click on a component with a red status button to view the component that needs attention.

About Controller Virtual Ports

Virtual Ports change IO ports from a physical to a virtualized representation. This eliminates the need for reserve ports. All ports are primary and can read and write IO. If a port fails, any port within the Fault Domain takes over for the failed port. Once enabled, Virtual Ports are displayed in the system tree under the IO card to which they belong.

The Virtual Port Display in Explorer View shows the Home Controller. The Home Controller is the Personality Group for the port that currently is restricted to a single controller. You can only move the Preferred Physical Port to a controller within the same Home Controller (Personality Group).

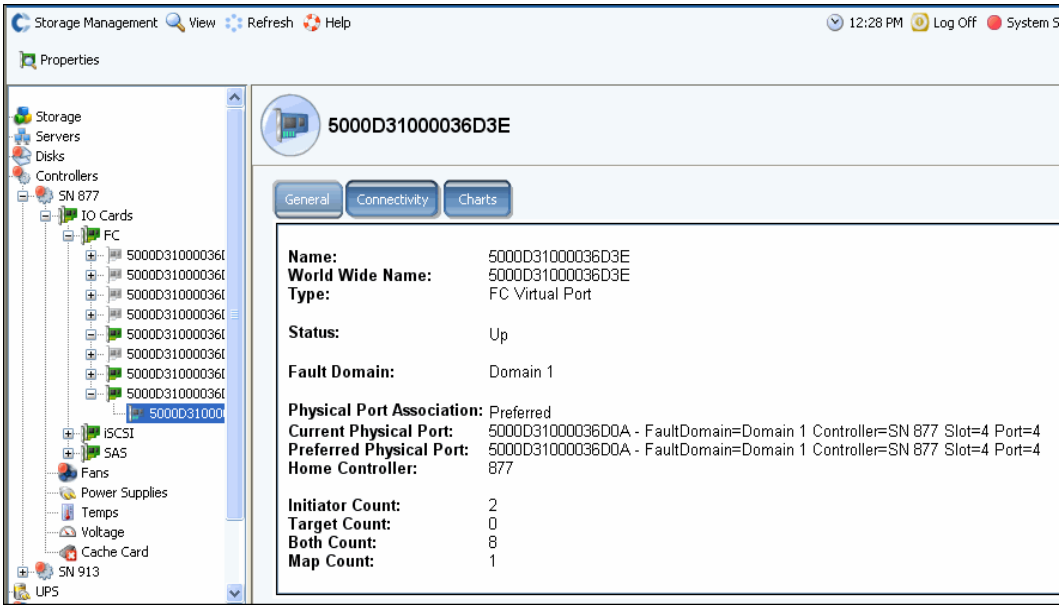


Figure 111. VIrtual Port Display in Explorer View

- For FC and iSCSI: For each physical port, the System Manager displays a virtual port. The physical port window displays the physical identity, speed, and hardware. The virtual port window displays the current and preferred physical port. Both windows identify the fault domain for that port.
- For iSCSI only: The System Manager creates a Control Port for each iSCSI Fault Domain (usually there is only one). In a dual-controller system, the Control Port appears on only one controller, even though it controls all the iSCSI cards within that Domain.

Note SAS does not support Virtual Ports.

Although you can have more than one Fault Domain per transport system (such as iSCSI or FC), redundancy is best achieved by creating one Fault Domain per transport system.

Viewing Controller Properties

Viewing General Controller Properties

1 In the system tree, select a Controller.

2 From the shortcut menu, select **Properties**. The **Controller Properties** window appears with the general tab selected..

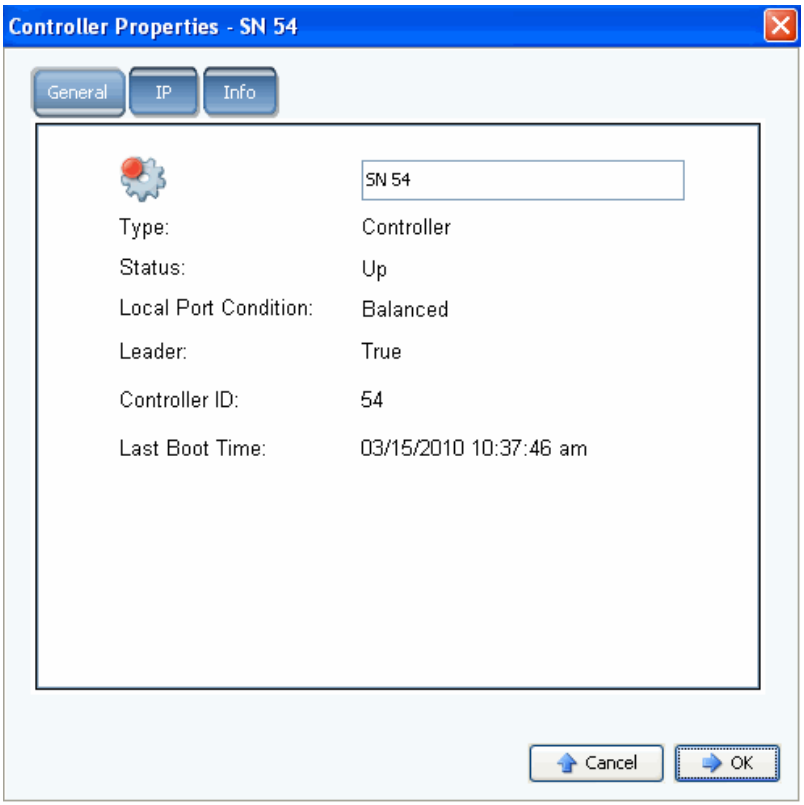


Figure 112. Controller General Properties

3 System Manager displays:

- **Controller Name**: Enter a new controller name and click OK.
- **Type**: of component in Controller Properties window is controller.
- **Status**: can be Up or Down
- **Local Port Condition**: can be balanced or unbalanced.
- **Leader**: This controller is either the leader (true) or not the leader (false). If a controller is not the leader, it is a peer.
- **Controller ID**: A number that identifies this Storage Center system.
- **Last Boot Time**: Date and time of last reboot.

4 Click **OK**.

Viewing Controller IP Properties

Note Do not change any IP properties in the **Controller Properties** window without the guidance of a Dell Support Services. Changing IP properties can result in the loss of data.

1 In the system tree, select a Controller.

2 From the shortcut menu, select **Properties**.

3 Click the **IP** tab.

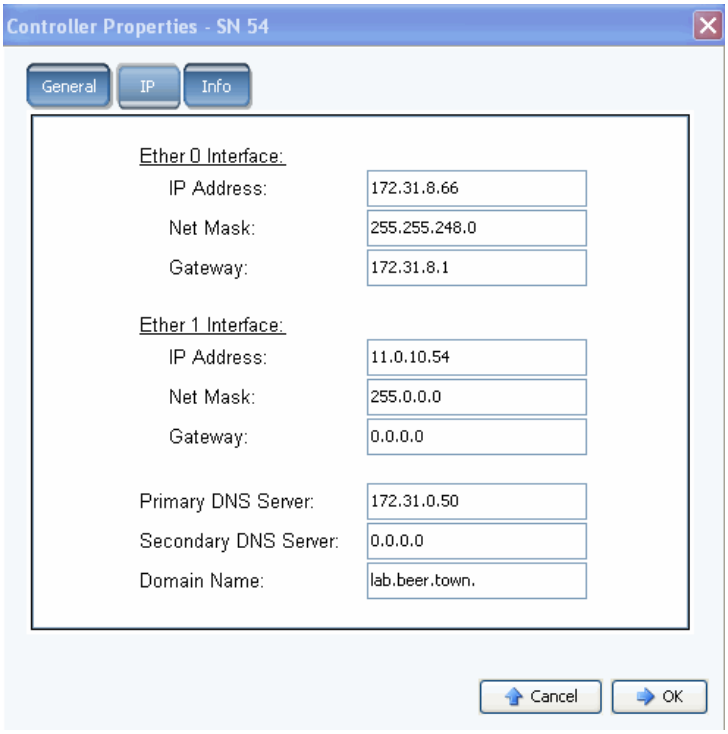


Figure 113. Controller IP Properties

In the **Controller Properties** window, the system permits you to change the **Ether 0** and **Ether 1 IP Addresses, Net Mask**, **Gateway**, **DNS Servers**, and **Domain Name**.

4 Click **OK**.

Viewing and Adding Controller Information

1 In the system tree, select a Controller.

2 From the shortcut menu, select **Properties**. The **Controller Properties** window appears.

3 Click the **Info** tab to view information about controller creation and updates.

4 Optionally, you can add notes (up to 255 characters).

Viewing Controller Status

Controllers display the status of system components.

1. In the system tree, select a controller.
2. From the list of components in the System Tree, select one of the following physical components to display a visual representation of the component.

   - Fans

     To view fan status, in the system tree, select a **fan**. For each of the blowers in the fan module, System Manager displays fan status and current RPM. The RPM gauge displays fan zones. The system operates in the green zone. If system is not operating in green zone, adjust ambient temperature of system. The window displays the normal minimum and maximum RPMs, and upper and lower critical and warning RPMs.

   - Power Supplies

     To view the status of a power supply in the system tree, select **Power Supplies**. System Manager displays the power supply name, if it is present, if there is a failure, and if the AC is lost.

   - Temperature Sensors

     To view controller temp status of the sensors on the controller board, in the system tree, select **Temps**. System Manager displays temp properties including position of the sensor, status, and current temp. The Temp Gauge displays temperature zones. The system should operate in the green zone. The window displays the normal minimum and maximum temp, and upper and lower critical and warning temperatures.

   - Voltage

     To view voltage, in the system tree, select **Voltage**. System Manager displays voltage properties including position of the sensor, status, and current voltage. The Voltage Gauge displays voltage zones. The system should operate in the green zone. The window displays the normal minimum and maximum voltage, and upper and lower critical and warning voltage.

   - Cache Card

     To view cache card, in the system tree, select **Cache Card**. System Manager displays information about the card including the cache card model, cache size, firmware version, in service date, expiration information, and status.

     As the CHA 3 card does not have a battery, battery expiration date and status fields are blank.

Note Cache card information may be required by Dell Support Services.

Viewing a List of Controllers

In the system tree, select **Controllers**. In the main window, System Manager displays a list of controllers with the following information:

- **Name**
- **Status**
- **Local Port Condition**
- **Leader**
- **Controller ID**
- **Last Boot Time**

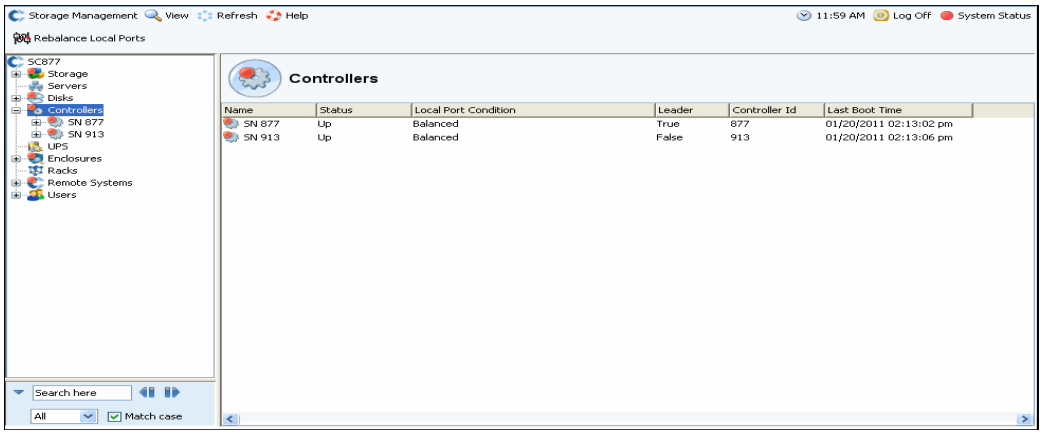


Figure 114. List of Controllers

Viewing General Controller Information

In the system tree, select a controller. The system displays general controller information.

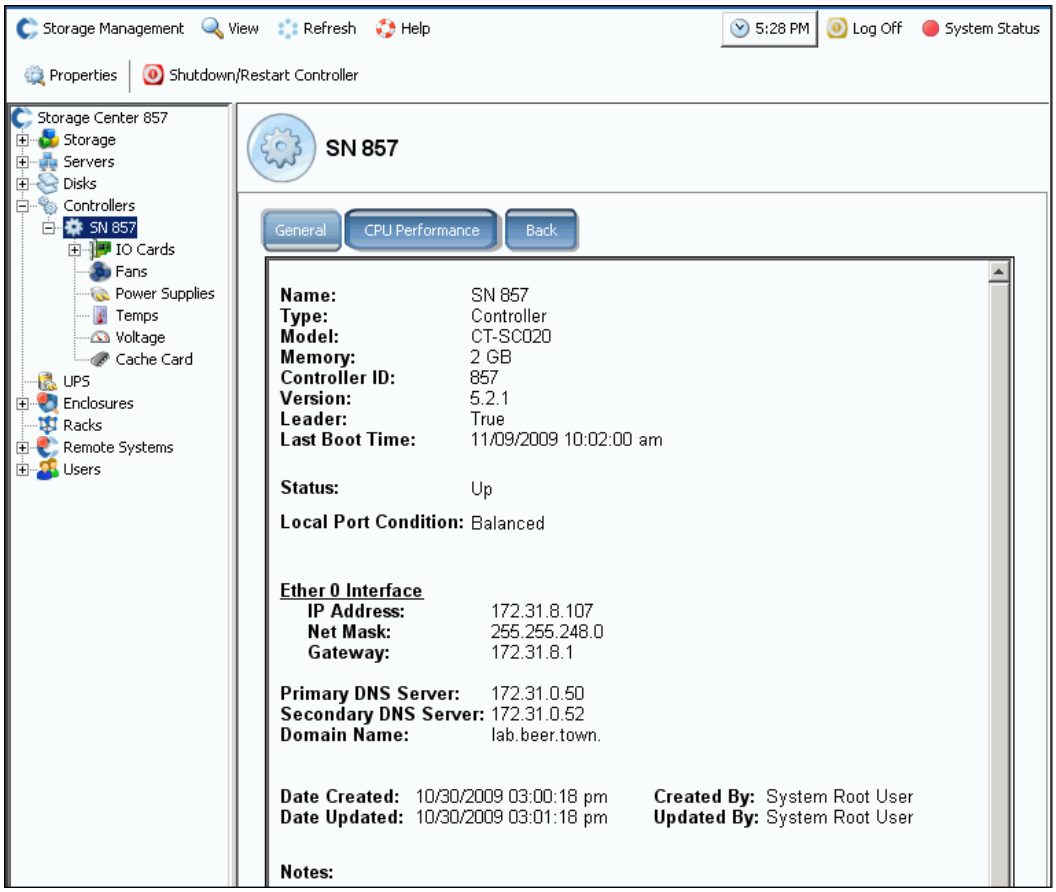


Figure 115. General Controller Information

- **Name**
- **Type**
- **Model**
- **Memory**
- **Controller ID**
- **Version**
- **Leader**
- **Last Boot Time**
- **Status**
- **Local Port Condition**
- **Interface**
- **Primary DNS and Secondary DNS Servers**
- **Domain Name**

- Dates created and updated and by whom

Viewing Controller CPU Performance Information

Click the **CPU Performance** tab. The **CPU Performance** window appears, showing percent usage.

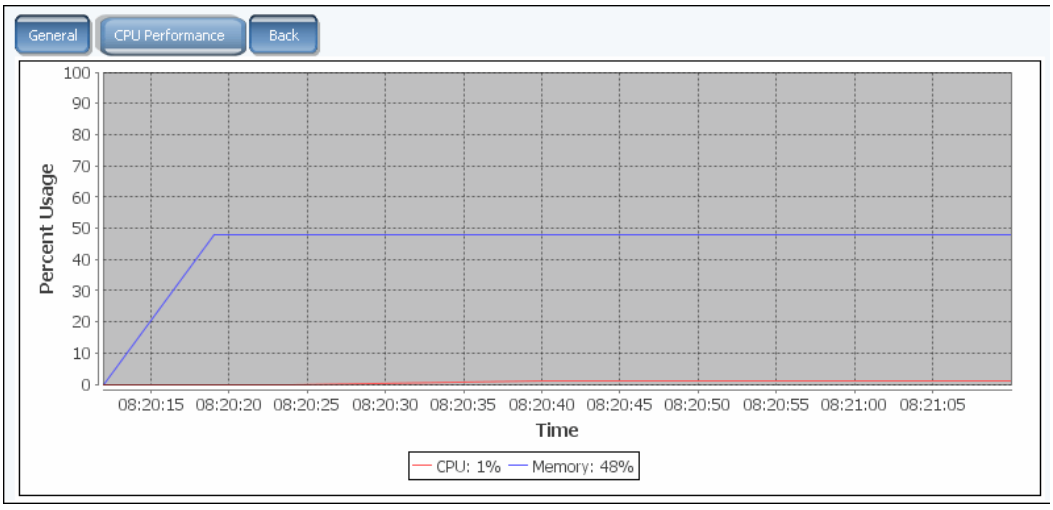


Figure 116. CPU Performance

The system automatically retrieves statistics of the selected controller. The GUI automatically stops gathering statistics when a CPU Performance window is not opened for one hour or if your session times out before the hour has passed.

Viewing the Back of a Controller

1 Click the **Back** tab. The system displays a visual representation of the controller.

2 Right click an IO port to display the menu for the component.

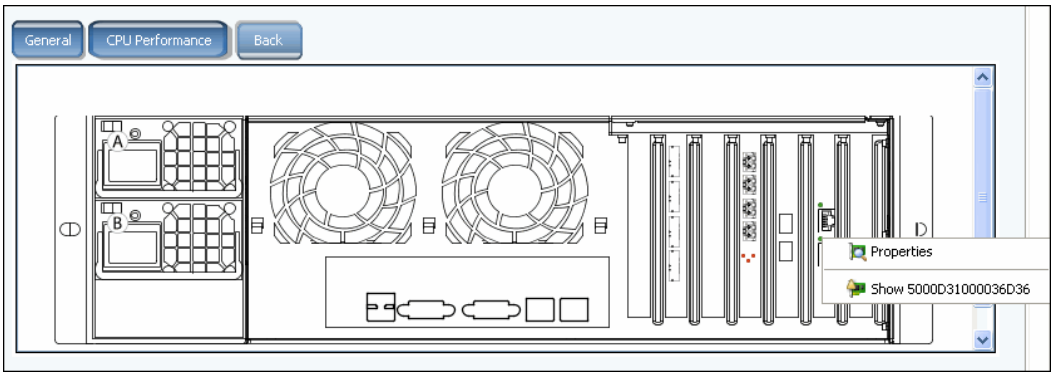


Figure 117. Controller Back

Viewing FC Folders and Cards

Viewing FC Folders

In the system tree, expand controllers and IO cards to view the FC card folder. The FC status window appears.

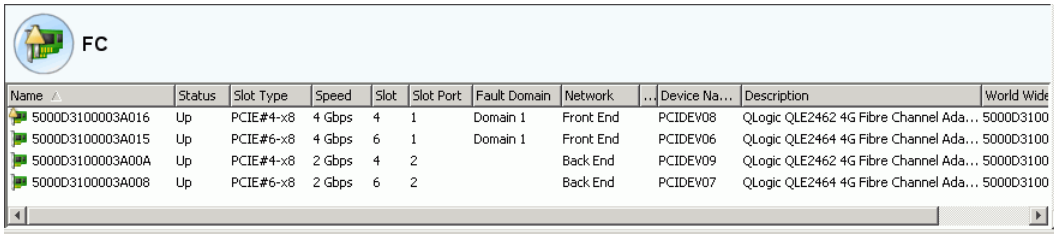

FC
Name
Status
Slot Type
Speed
Slot
Slot Port
Fault Domain
Network
Device Na...
Description
World Wide
5000D3100003A016 Up PCIE#4-x8 4 Gbps 4 1 Domain 1 Front End PCIDEV08 QLogic QLE2462 4G Fibre Channel Ada... 5000D3100
5000D3100003A015 Up PCIE#6-x8 4 Gbps 6 1 Domain 1 Front End PCIDEV06 QLogic QLE2464 4G Fibre Channel Ada... 5000D3100
5000D3100003A00A Up PCIE#4-x8 2 Gbps 4 2 Back End PCIDEV09 QLogic QLE2462 4G Fibre Channel Ada... 5000D3100
5000D3100003A008 Up PCIE#6-x8 2 Gbps 6 2 Back End PCIDEV07 QLogic QLE2464 4G Fibre Channel Ada... 5000D3100

Figure 118. FC IO Card Folder

The folder window displays:

- **Name**
- **Status**: Up or Down
- **Slot Type:** such as PCI
- **Speed**
- **Slot:** Number in the controller
- **Slot Port**: Port number
- **Fault Domain**
- **Network**: Whether the card is configured front end, back end, or unknown.
- **Device Name**: Type of card
- **Description**: Identification of the card
- **Worldwide Name**: Unique name for this item

Viewing FC IO Card Information

If Virtual Ports are not enabled, the system displays information for the physical card. If Virtual Ports are enabled, the System Manager displays information for both the physical FC IO card and the Virtual Port that resides on the card.

To view general information for an FC port - legacy and virtual ports

Select an FC port. The system displays general FC port information.

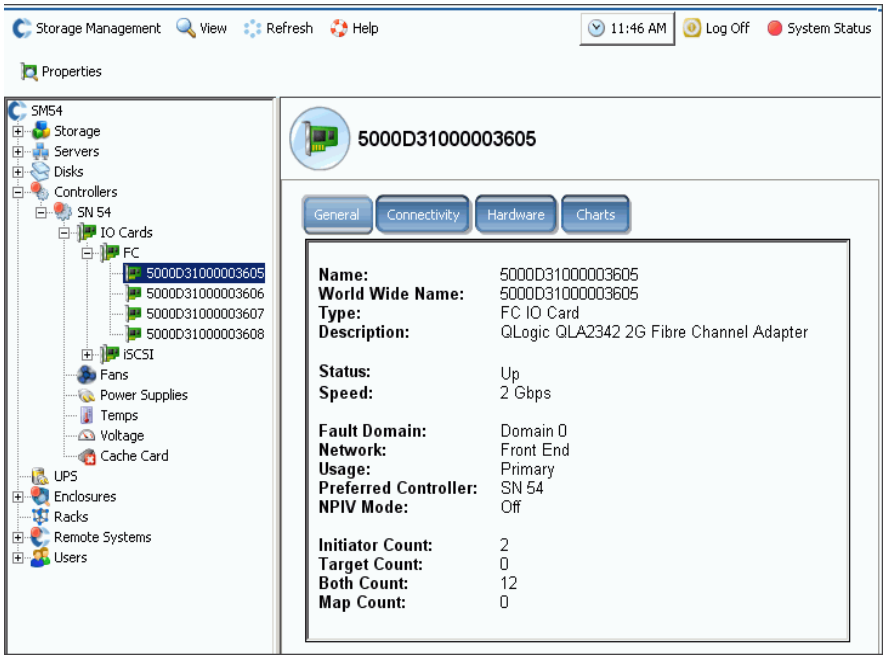


Figure 119. FC IO Card Information

General Tab Information includes:

- **Name**
- **World Wide Name (WWN)**
- **Type of object**: FC IO Card
- **Description:** Identification of HBA
- **Status**: Up, Down, or Reserved
- **Speed**: of IO
- **Fault Domain**: If port is front-end, shows fault domain. If port is back-end, this is blank
- **Network**: Front End, Back End, or Unknown
- **Usage**: If the port is front end, whether it is a Primary or Reserved Port. If it is back end, whether it is in use.
- **Preferred Controller**: When ports are rebalanced, choose a preferred controller.
- **NPIV Mode**: Indicates whether NPIV Mode is turned on to allow FC Virtual Ports. When converting an FC port to Virtual Mode, NPIV *must* be enabled on the attached switch.
- **Initiator Count**: Number of front-end connections

- **Target Count:** Number of active disk drives in this system
- **Both Count**: Total of front-end devices and back-end disk drives
- **Map Count**: Number of volumes mapped to this system

Viewing FC Virtual Port Mode General Information

General information for an FC card with Virtual Ports enabled is divided between the FC IO card and Virtual Ports on the IO card.

Note The information displayed is the same as that of a FC IO card without Virtual Ports (shown in Figure 119 on page 151), except that Usage and Preferred Controller are not displayed.

To view general information for an FC port – physical ports

If Virtual Ports are enabled, the System Manager displays information for both the physical FC IO card and the Virtual Port that resides on the card.

1 To view information for the physical port, select an FC Card. The FC IO card General Information window appears.

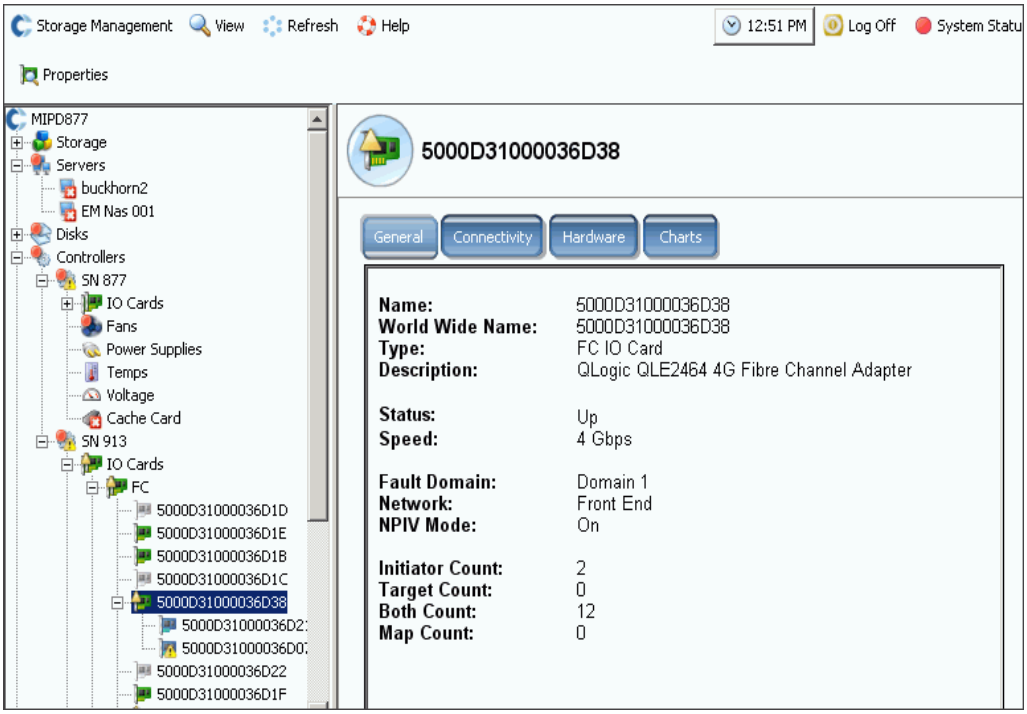


Figure 120. FC IO Card General Information – Physical Port

The window displays:

- **Name**
- **World Wide Name**: Unique name for this item
- **Type**: Slot type

- **Description**: Identification of the card
- **Status**: Up or Down
- **Speed**: IO speed
- **Fault Domain**: If port is front-end, shows fault domain. If port is back-end, this is blank.
- **Networ**k: Whether the card is configured Front End, Back End, or Unknown.
- **NPIV Mode**: Indicates whether NPIV Mode is turned on to allow FC Virtual Ports. To convert an FC port to Virtual Mode, NPIV *must* be enabled on the attached switch.
- **Initiator Count**: Number of front end devices
- **Target Count**: Number of disk drives
- **Both Count**: Total of front-end devices and back-end disk drives
- **Map Count**: Number of volumes mapped to this system

To view general information for an FC port – virtual ports

1 In a Controller folder, select an Virtual Port. The Virtual Port General Information window appears.

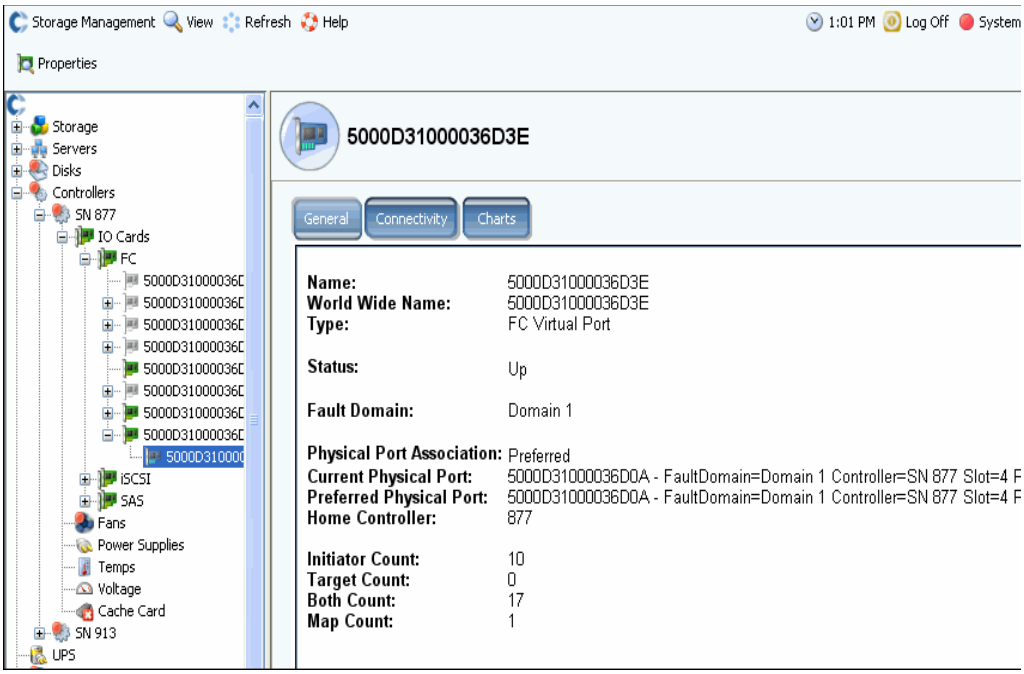


Figure 121. FC IO Card General Information – Virtual Port

The window displays:

- **Physical Port Association**: Preferred or Not Preferred
- For both the Current and the Preferred Physical Port, the window displays:
  - **World Wide Name**
  - **Fault Domain**
  - **Name of the Controller**

- **Slot**
- **Port**

- **Home Controller**
- **Initiator Count**: Number of front end devices
- **Target Count**: Number of disk drives
- **Both Count**: Total of front-end devices and back-end disk drives
- **Map Count**: Number of volumes mapped to this system

Note Virtual Ports do not display hardware because the port is not reliant on a card.

Viewing FC IO Card Status

Connectivity is the same for FC cards with or without Virtual Ports enabled.

To view FC IO card connectivity status

1. In the system tree, select an FC card.
2. In the FC IO Card window, select the **Connectivity** tab. The FC IO Card Connectivity window appears.

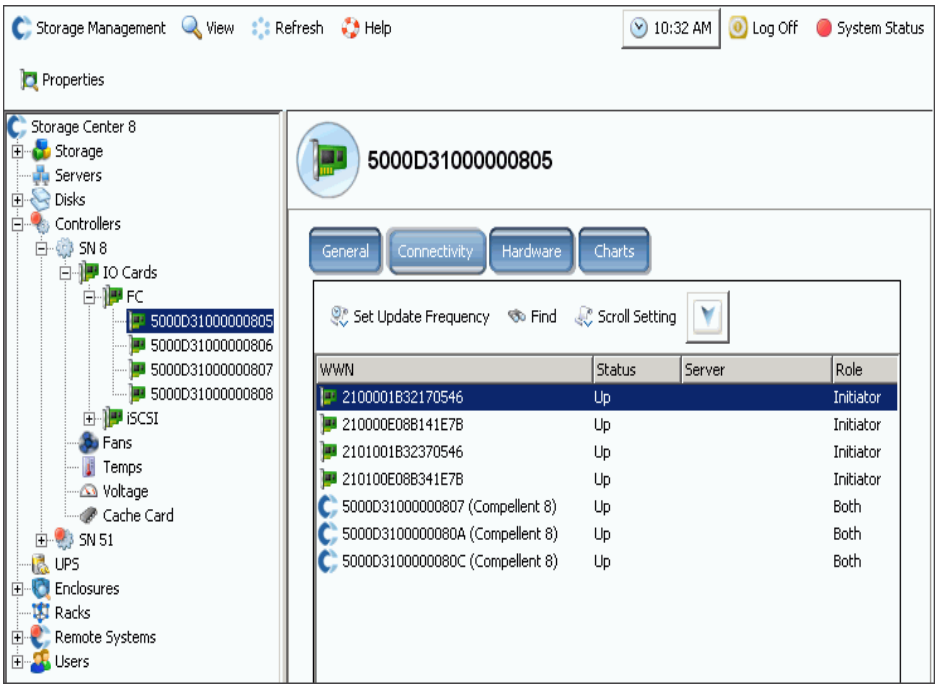


Figure 122. FC IO Connectivity

3. The window displays:
   - **WWN**
   - **Status**
   - **Server**

- **Role (initiator or target)**
- **Port ID**
- **Node Name**
- **Symbolic Port Name**
- **Symbolic Node Name**

To set the update frequency of FC card status

1 In the FC IO Card Connectivity Status window, click the **Connectivity** tab.

2 In the Connectivity window, click **Set Update Frequency**.

3 Choose one of the following: **Off, 5 Seconds, 30 Seconds, 1 Minute, or 5 Minutes**.

To view FC IO card hardware status

1 In the system tree, select an FC card.

2 In the FC IO Card window, click the **Hardware** tab. The FC IO card Hardware Status window appears.

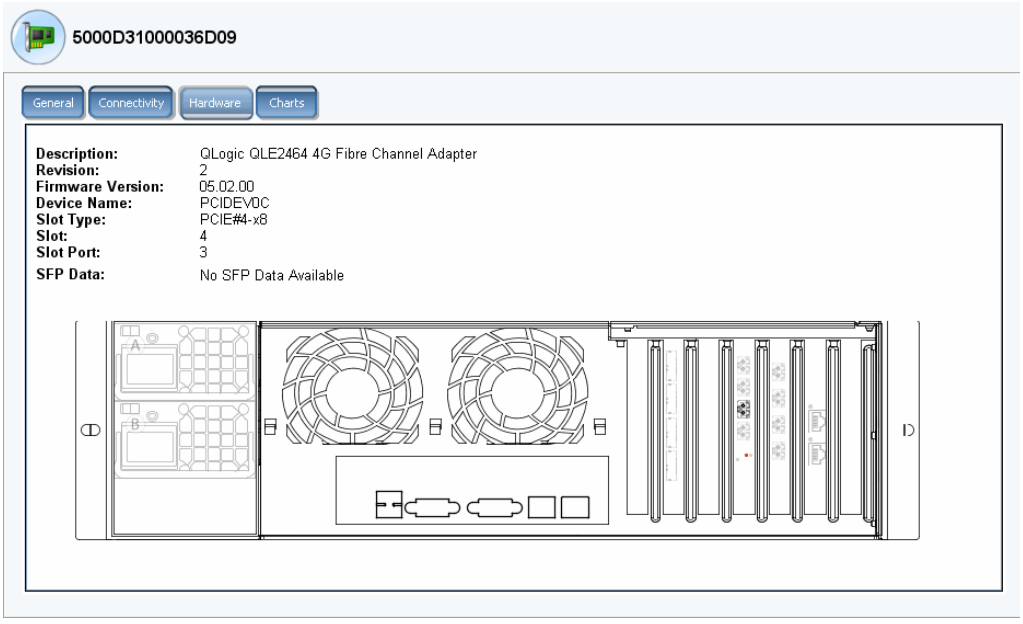


Figure 123. FC IO Card Hardware

The port location is highlighted. Mousing over the card displays the name and type. Right-clicking over the card displays the shortcut menu, from which you can view IO Card Properties.

To view FC IO card performance charts

In the system tree, select an FC card. In the FC IO Card window, click **Charts**. The FC IO Card charts appears.

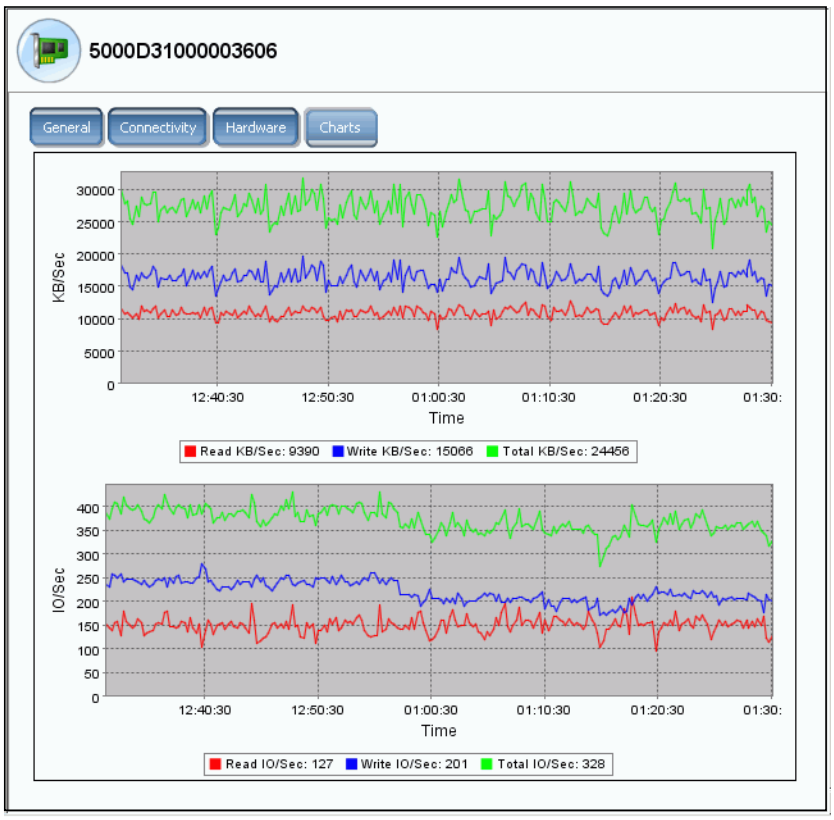


Figure 124. FC IO Card Chart

For each FC IO card, System Manager displays:

- KB per second Reads, Writes, and Total KB/Sec.
- IOs per second for Reads, Writes, and Total IO per second

Viewing FC IO Card Properties

To view FC IO card properties – physical ports

1 In the system tree, select an FC card.

2 From the shortcut menu, select **Properties**. The FC IO Card Properties window appears:

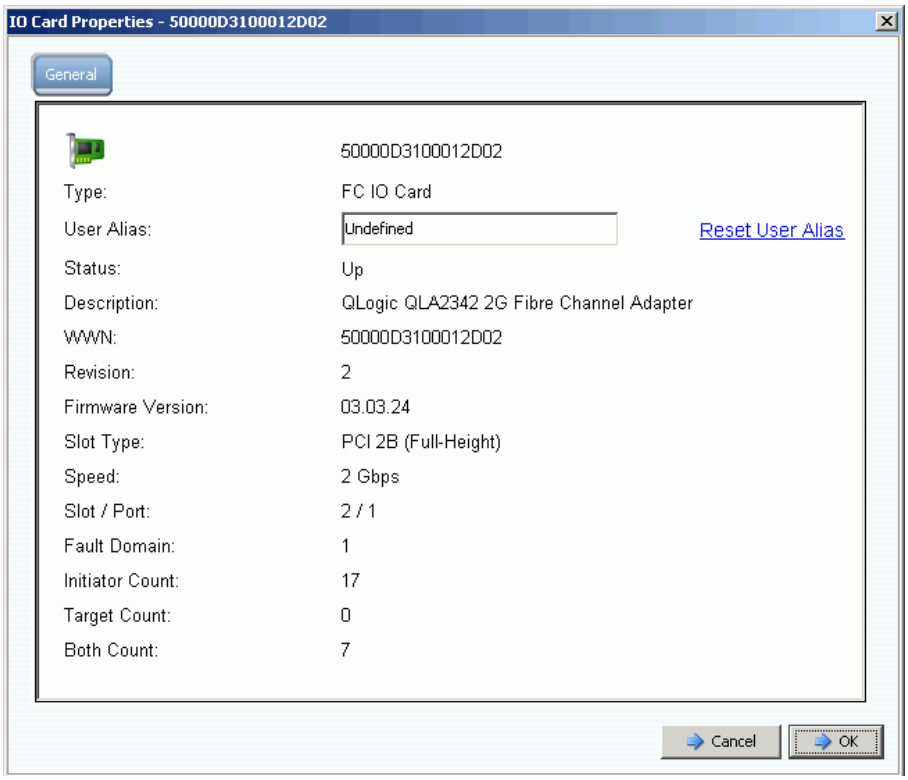


Figure 125. FC IO Card Properties

The window displays:

- **World Wide Name (WWN)**
- **Card type**
- **User Alias**: If any and ability to reset the user alias
- **Status**: Up or Down
- **Description, revision, firmware version**
- **Slot type, speed, slot, slot port**
- **Fault Domain**
- Counts: **Initiator, Target**, and **Both Count**

Changing FC Virtual Port Properties

From the Properties window, you can change either the fault domain or the preferred physical port of the FC Virtual Port.

To change FC virtual port properties

1 Select a FC Virtual Port.

2 From the shortcut menu, select **Properties**. The FC Virtual Port Properties window appears:

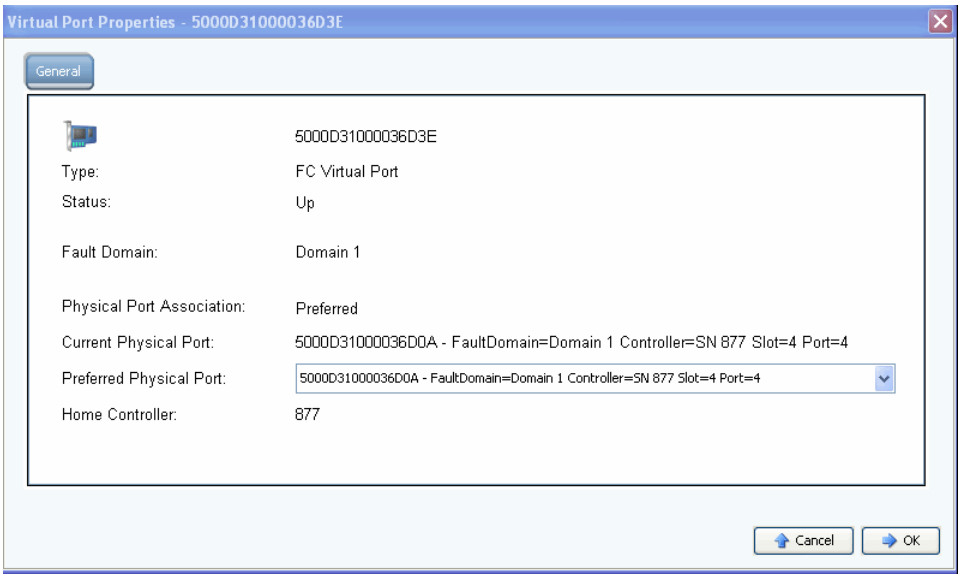


Figure 126. FC Virtual Port Properties Window

3 From the drop-down menu, change the Preferred Physical Port.

4 Click **OK**.

Changing and Resetting the User Alias

1 In the system tree, select an FC card.

2 From the shortcut menu, select **Properties**.

3 Enter a user alias (port name).

4 Click **OK**. The new name appears in the system tree.

1 In the system tree, select an FC card.

2 From the shortcut menu, select **Properties**.

3 Click **Reset User Alias.**

4 Click **OK**.

Viewing iSCSI Cards

Viewing iSCSI Folders

To view iSCSI card folders – legacy mode

To view controllers, for each controller in the system tree, select an iSCSI card folder. The system lists iSCSI cards on the selected controller.

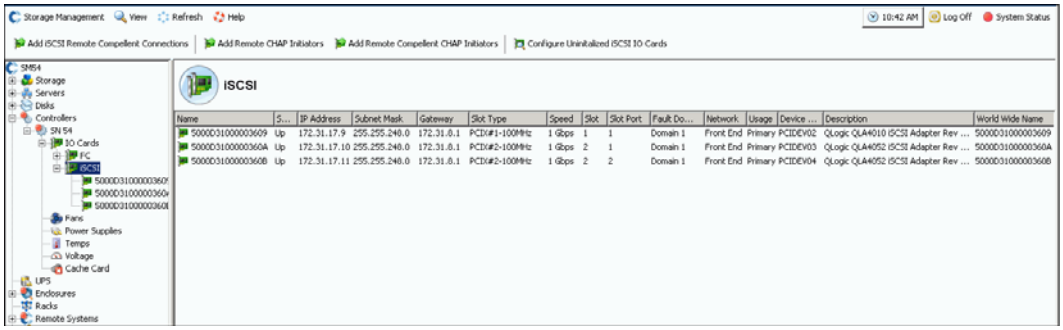


Figure 127. iSCSI Card Folder in Legacy Mode

System Manager displays

- **Name**
- **Status**: Up or Down
- **IP Address, Subnet Mask, and Gateway**
- **Slot Type**: such as PCIE or PCIX
- **Speed**
- **Slot and Slot Port**
- **Fault Domain**
- **Network**
- **Usage**: **Primary** or **Reserved**
- **Device Name**
- **Description:** of the adapter, such as QLA4010 or QLA 4052
- **World Wide Name**

To view iSCSI card folders – virtual port mode

A Control Port was created during Virtual Port setup for each iSCSI Fault Domain (and usually there is only one). The system communicates to the iSCSI ports through the Control Port address. The Control Port resides in the system tree within the iSCSI folder. In a dual-controller system, the Control Port can reside within the iSCSI folder of either controller; all iSCSI ports on both controller in the same Fault Domain use the same Control Port. Traffic is redirected to the appropriate Virtual Port.

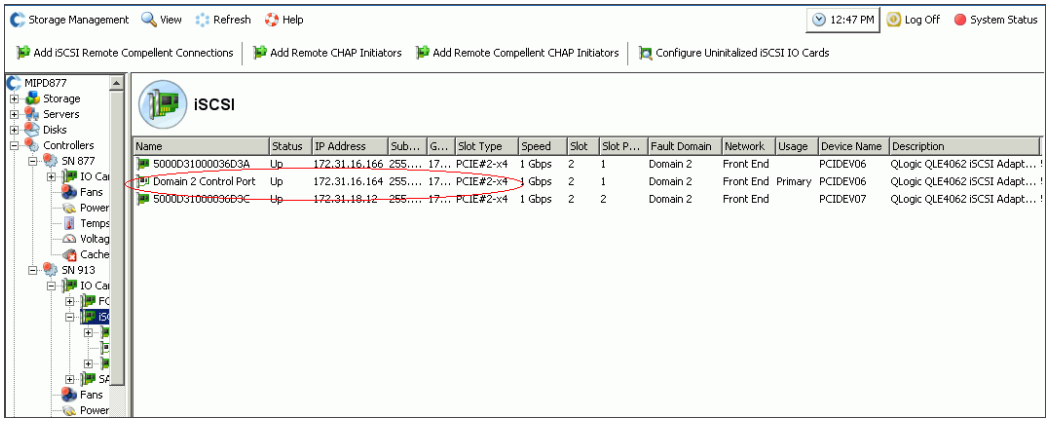


Figure 128. iSCSI Card Folder Containing Control Port

Viewing iSCSI IO Card Information – Physical Ports

In the system tree, select an iSCSI card.

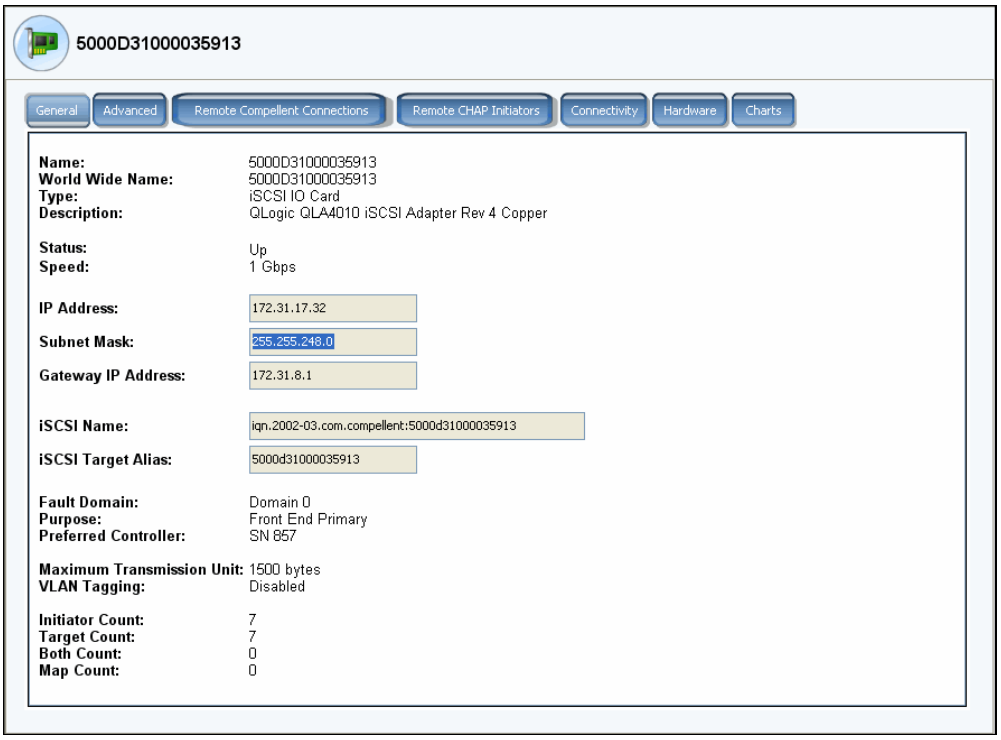


Figure 129. iSCSI IO Card Properties

The system displays Legacy Mode iSCSI card information, including:

- **Name**
- **World Wide Name**
- **Type of card**
- **Description**
- **Status**: Up or down

- **Speed:** of IO transfer
- **IP Address, Subnet Mask, and Gateway IP Address**
- **iSCSI Name** and **Target Alias**
- **Fault Domain, Network, and Usage as entered via the Configure Local Ports wizard.**
- **Port purpose**
- **Preferred Controller**: Appears if a system is rebooted.
- **Maximum Transmission Unit**
- **VLAN Tagging**
- **Initiator Count**: Number of front end devices
- **Target Count**: Number of disk drives
- **Both Count**: Total of front-end devices and back-end disk drives
- **Map Count**: Number of volumes mapped to this system

Note Virtual Ports do not display hardware because the port is not reliant on a card.

Viewing iSCSI IO Card General Information – Virtual Ports

Click on an a Control Card. The following figure shows an iSCSI virtual port in the system tree.

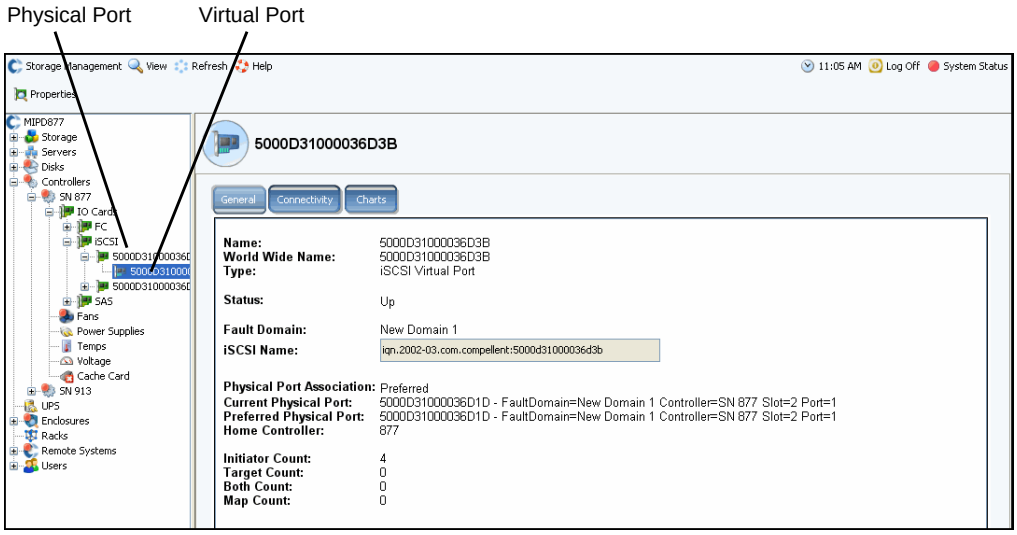


Figure 130. iSCSI Virtual Port Card Information

The system displays iSCSI card information, including:

- **Name**
- **World Wide Name**
- **Type**: of object (iSCSI IO card)
- **Description**
- **Fault Domain**
- **iSCSI Qualified Name (IQN)**: for the card
- **Physical Port Association** that can have the following values:
  - **Preferred**: The Virtual Port is currently connected to the Preferred Physical Port
  - **Not Preferred**: The Virtual Port is not currently connected to the Preferred Physical Port (words are yellow - causes warning icon)
  - **Detached:** The Virtual Port is not attached to any port (words are red - port is down).
- **Current Physical Port**
- **Preferred Physical Port**
- **Home Controller**
- **Initiator Count**: Number of front end devices
- **Target Count**: Number of disk drives
- **Both Count**: Total of front-end devices and back-end disk drives
- **Map Count**: Number of volumes mapped to this system

Viewing iSCSI Control Port Information

In the system tree, select a control port.

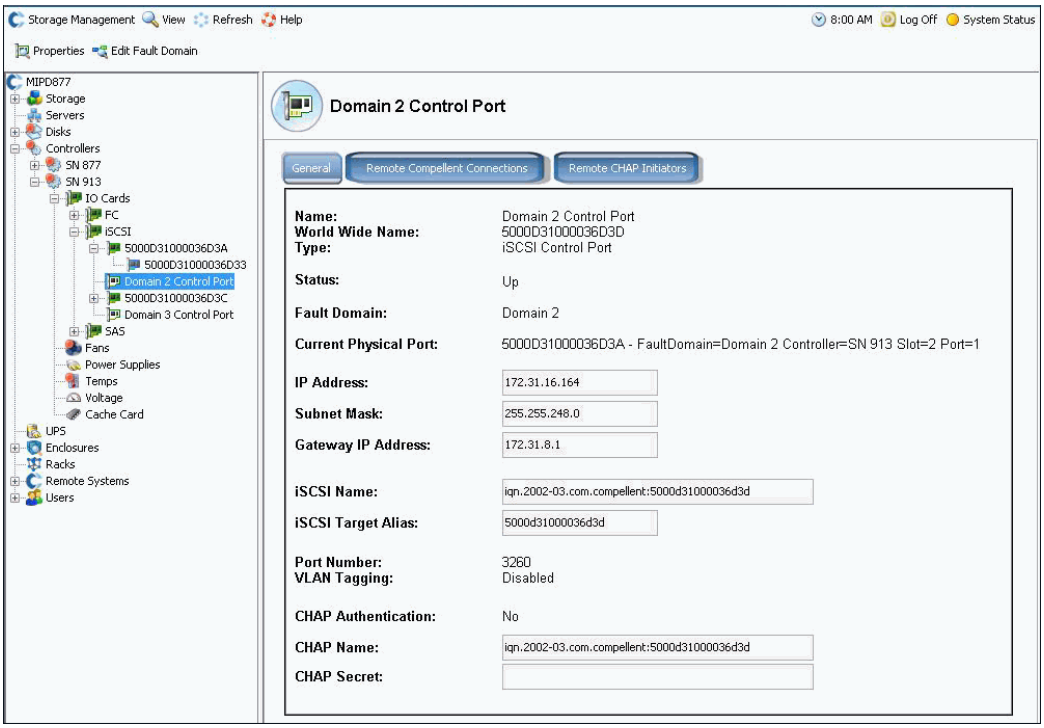


Figure 131. iSCSI Control Port Display

- You cannot change information in this window, but you can select and copy it in windows.
- The port number is the TCP port number. The default iSCSI port number is 3260 but it can be changed if there is a special requirement to use different TCP port number. Refer to Changing Advanced iSCSI Card Properties on page 172.
- For more information about VLAN tagging, refer to Enabling VLAN Tagging on page 171.

Viewing Advanced iSCSI Card Information

1 In the system tree, select an iSCSI card. The system displays General iSCSI card information.

2 Click the **Advanced** tab. The iSCSI Advanced legacy card information appears.

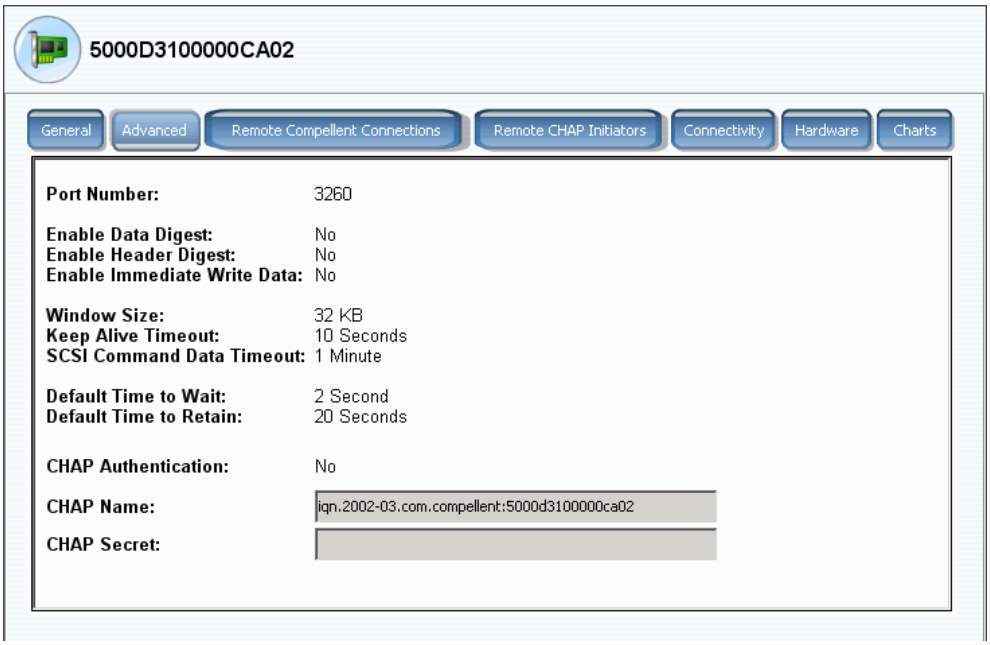


Figure 132. Advanced iSCSI Card Information

Note Information and tabs displayed will vary depending on whether you have remote connections set up using CHAP. For information about CHAP, refer to Configuring Remote Connections Using CHAP on page 181.

Information includes:

- **Port Number:** TCP port number - default is 3260
- **Enable Data Digest**: An ISCSI data digest enables a digest (32 bit CRC) on all iSCSI data Protocol Data Units (PDUs).
- **Enable immediate Write Data**
- **Window Size:** from 32 to 2048 KB
- **Keep Alive Timeou**t: from 5 seconds to 18 hours
- **SCSI Command Data Timeout:** from 5 seconds to 18 hours
- **Default time to Wait**: **from 1 second to 10 minutes**
- **Default Time to Retain**: from 1 second to 10 minutes
- **CHAP Authentication**
- **CHAP Name**
- **CHAP Secret**

To view iSCSI IO card connectivity

1 In the system tree, select an iSCSI card.

2 Click the **Connectivity** tab. The system displays iSCSI card connectivity, if any.

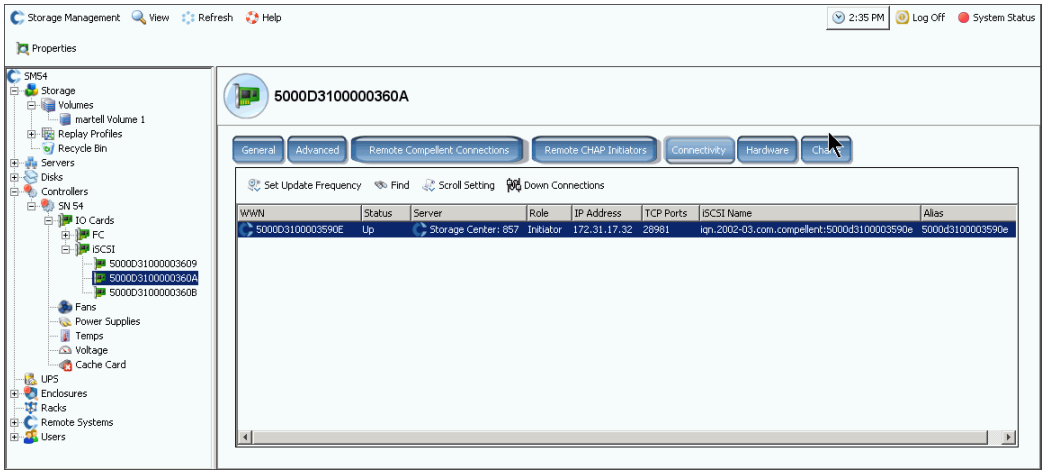


Figure 133. iSCSI Connectivity Window

Note Information and tabs displayed will vary depending on whether you have remote connections set up using CHAP. For information about CHAP, refer to Configuring Remote Connections Using CHAP on page 181.

Information includes:

- **WWN**. A Compellent icon indicates a remote system.
- **Status:** Up or Down
- **Server:** mapped to this card
- **Role**: Initiator or target
- **IP address**
- **TCP ports**
- **iSCSI Name**
- **Alias**

To view iSCSI hardware information

1 In the System Tree, select an iSCSI card.

2 Click the **Hardware** tab. The Hardware window appears.

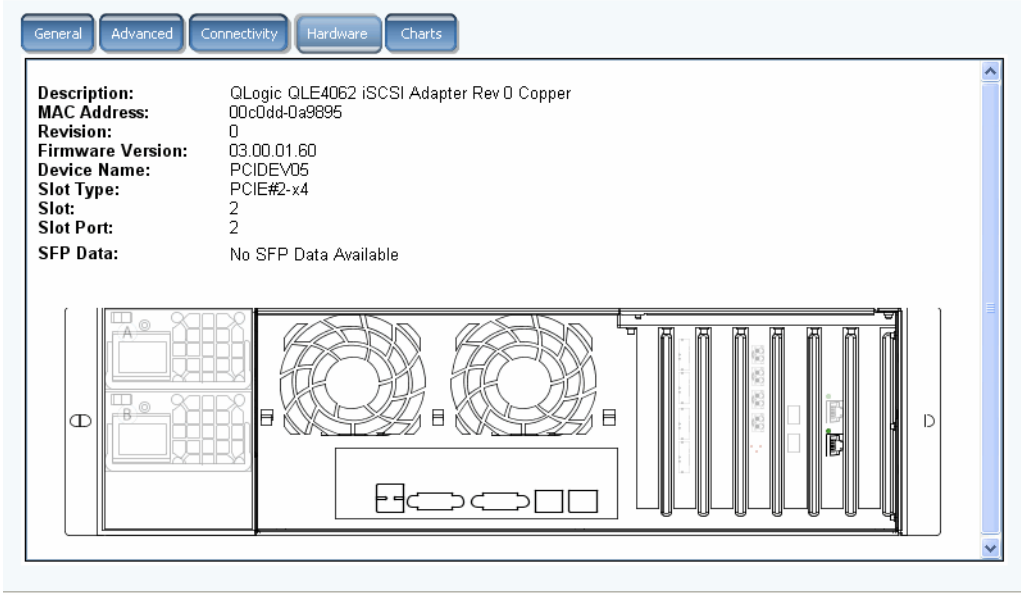


Figure 134. iSCSI Hardware

Information includes:

- **Description**: Card name, number, and revision
- **MAC address**
- **Revision**
- **Firmware Version**: for IO card
- **Device Name**: PCIE or PCIX
- **Slot type**
- **Slot**: Numbered from 1 on the right to 6 on the left
- **Slot Port**: Numbered from top to bottom from 1 to 4
- **SFP Data**: data sent by Small Form-factor Pluggables (SFPs allow network operators to connect different interface types to the same network equipment via an SFP port.)

The port location is highlighted. Mousing over the port displays port name and type. Right-click to open the shortcut menu (shown below), from which you can view Properties and status.

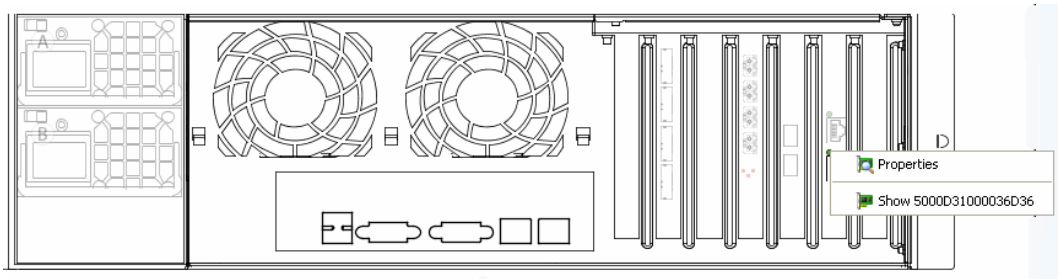


Figure 135. iSCSI Card Mouse-over

To view iSCSI performance charts

In the General Display window click **Charts. The** Charts window opens. Charts will vary depending if Virtual Ports are enabled or not.

Figure 136. iSCSI Chart with Virtual Ports Not Enabled

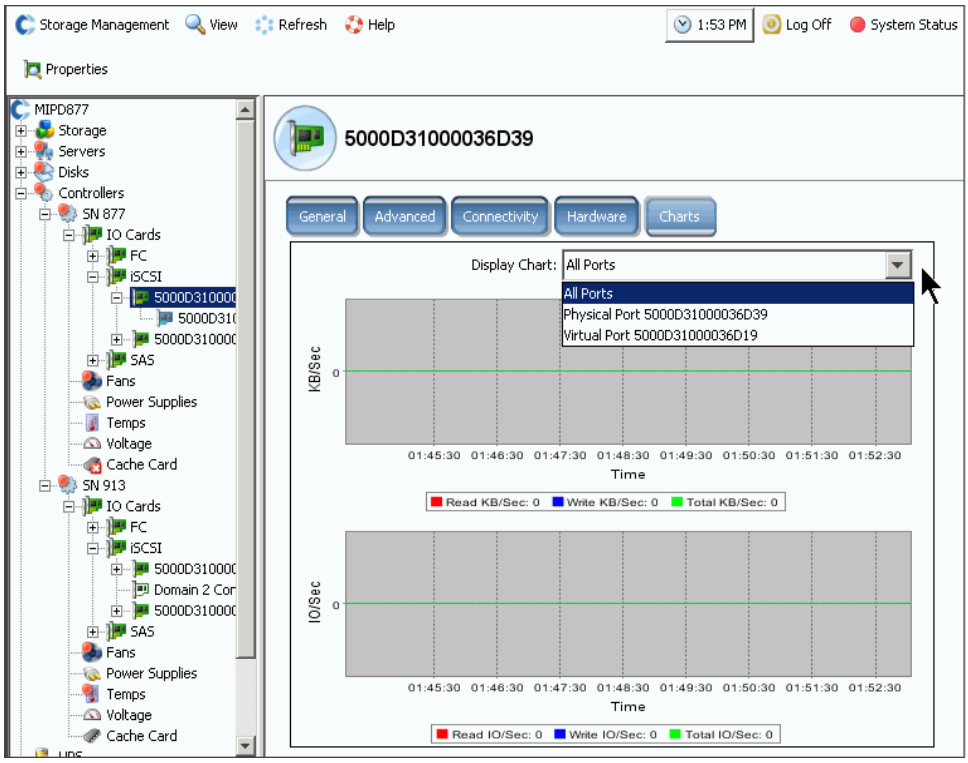


Figure 137. iSCSI Chart with Virtual Ports Enabled

Changing an iSCSI Control Port Fault Domain

1 Select an iSCSI control port as shown in Figure 131 on page 163.

2 From the shortcut menu, select **Edit Fault Domain**. The Fault **Domain Properties** window appears.

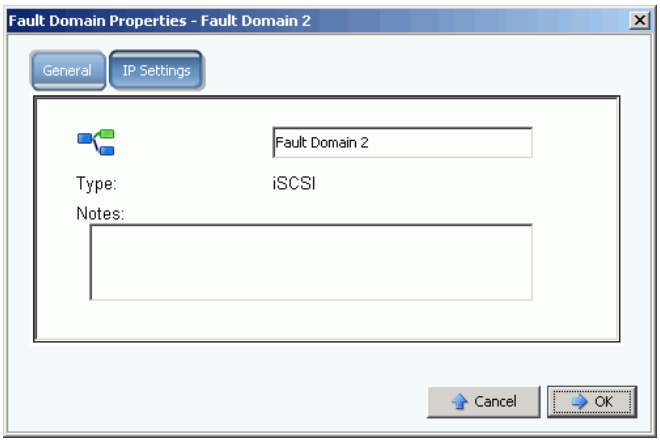


Figure 138. Edit iSCSI Control Port Fault Domain

3 In the fault domain field, edit or change the fault domain.

Changing iSCSI Control Port IP Settings

1 Select an iSCSI control port.

2 From the shortcut menu, select **Edit Fault Domain**. The **Fault Domain Properties** window appears.

3 Select the **IP Settings** tab. The **IP Setting** window appears.

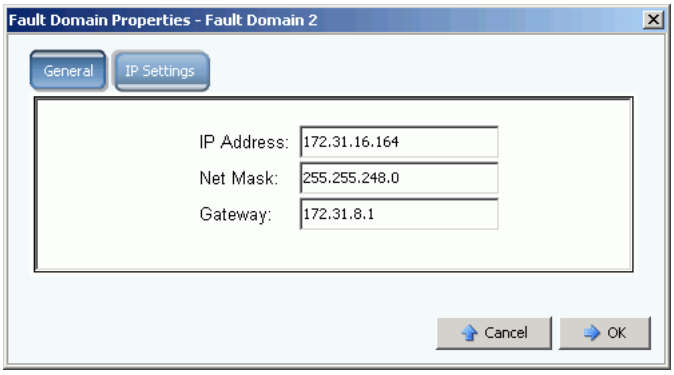


Figure 139. iSCSI Control Port IP Settings

4 Change the **IP Address**, **Net Mask**, or **Gateway.**

Viewing iSCSI IO Card Properties

1 In the system tree, select an iSCSI card.

2 From the shortcut menu, select **Properties**. The **IO Card Properties** window appears.

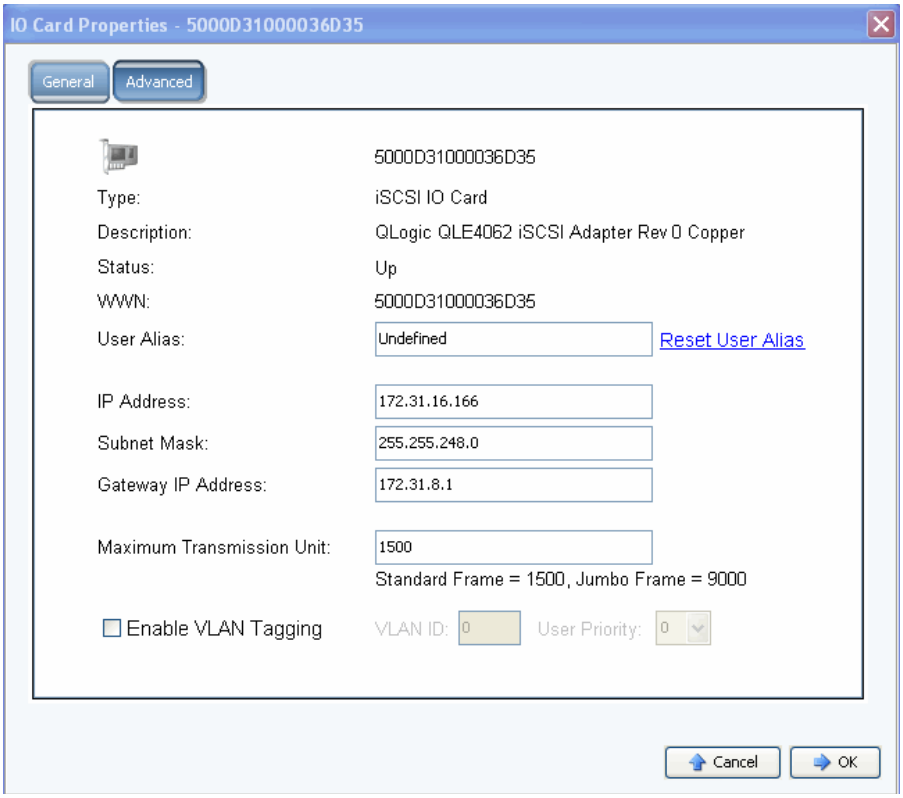


Figure 140. iSCSI IO Card Properties

3 The window displays:

- **Type:** iSCSI
- **Description**
- **Status:** Up or Down
- **WWN**
- **User Alias**
- **IP Address, Subnet Mask, Gateway IP Address**
- **Maximum Transmission Unit**: Standard or Jumbo Frames (Refer to Enabling Jumbo Frames on page 171.)
- **Enable or clear VLAN taggings**. (Refer to Enabling VLAN Tagging on page 171.)

To set a user alias

To enter a user alias, in the **IO Card General Properties** window, enter a user alias or click Reset User Alias.

To add an iSCSI card

To add an IO card to your system, in the **IO Card General Properties** window, enter an IP address, Subnet mask, or Gateway IP address.

Enabling Jumbo Frames

Note Not all cards support Jumbo Frames.

Enabling Jumbo Frames in the Storage Center controller can enhance network throughput and reduce use of the CPU. A Jumbo Frame is 9000 bytes compared to normal size of 1500 bytes. Throughput for large file transfers, such as large multimedia or data files, is increased by enabling larger payloads per packet. Larger payloads create more efficient throughput and require fewer packets to be sent. Environments with ISCSI servers running software initiators using standard or smarter NICs receive the biggest benefit from Jumbo Frames. Enabling Jumbo Frames can speed up iSCSI performance by about 5 percent, while reducing server CPU utilization by 2 percent to 3 percent.

Jumbo Frames are recommended only for LAN environments. Because TOE (TCP off-load engine) cards or HBAs already do off-loading, CPU savings from Jumbo Frames is minimal.

To enable Jumbo Frames

1. In the system tree, select an iSCSI card.
2. From the shortcut menu, select **Properties**. The **IO Card General Properties** window appears.
3. Set the **Maximum Transmission Unit** to 9000.
4. Click **OK**.

Enabling VLAN Tagging

Note Not all cards support VLAN tagging.

A virtual local area network (VLAN) is configured on a system switch. The four prominent VLAN membership methods switches support are by port, Media Access Control (MAC) address, protocol type, and subnet address. A VLAN consists of a network of computers that behave as if connected to the same wire - even though they may actually be physically connected to different segments of a LAN. Traffic on a single physical network can be partitioned into virtual LANs by tagging each frame or packet with extra bytes to denote which virtual network the packet belongs to. Several VLANs can co-exist within such a network. This reduces the broadcast domain and aids network administration by separating logical segments of a LAN (such as ISCSI SAN traffic).

System Manager does not know or need to know how VLAN membership is configured on a switch. The Storage Center ISCSI I/O port is an end station to the VLAN. VLAN can be enabled or disabled on an iSCSI port. The default is disabled. VLANs:

- Increase the number of broadcast domains but reduce the size of each broadcast domain, which in turn reduces network traffic and increases network security (both of which are hampered in cases of single large broadcast domains).
- Reduce management effort to create subnetworks.
- Reduce hardware requirement, as networks can be logically instead of physically separated.
- Increase control over multiple traffic types.

Each Storage Center iSCSI I/O card can be configured with VLAN identifier (VID). When a VID is configured, Storage Center becomes an end station in the VLAN.

Outbound / Inbound Ethernet Frames

When VLAN tagging is enabled, all outbound Ethernet frames are tagged. When VLAN tagging is not enabled, all outbound Ethernet frames are untagged. If the card is plugged into a switch that has been configured with a VLAN, the switch inserts the VID into the untagged Ethernet frame. When VLAN tagging is enabled, all inbound Ethernet frames must be tagged and the VID must match the configured VID for that interface. If the inbound Ethernet frame does not match the configured VID, the frame is discarded. Discarding frames is called VLAN filtering. When VLAN tagging is disabled, the inbound Ethernet frame must be untagged; otherwise Ethernet frame is discarded.

To enable VLAN tagging

1. In the system tree, select an iSCSI card.
2. From the shortcut menu, select **Properties**. The **IO Card Properties** window appears.
3. Select **Enable VLAN Tagging**.
4. Enter a VLAN ID (VID) to match the configured VID on the switch, from 1 to 4095.
5. Enter a user priority number. In the event of congestion, this gives a priority to the VLAN. Zero is the lowest priority and seven is the highest.
6. Click **OK**.

Changing Advanced iSCSI Card Properties

1. In the system tree, select an iSCSI card.
2. From the shortcut menu, select **Properties**. The **IO Card Properties** window appears.
3. Click **Advanced**. The **Advance IO Card Properties** window appears:
4. The Port number is TCP port number. The default iSCSI port number is 3260 but you can change it if there is a special requirement to use a different TCP port number.
5. iSCSI Header Digest enables a digest (32 bit CRC) on all iSCSI headers. An ISCSI Data Digest enables a digest (32 bit CRC) on all iSCSI data Protocol Data Units (PDUs). Select any of the following:
   - **Window size**: from 32 to 2048 KB
   - **Keep alive timeout**: from 5 seconds to 18 hours
   - **SCSI command data timeout**: from 5 seconds to 18 hours
   - **Default time to wait**: from 1 second to 10 minutes
   - **Default time to retain**: from 1 second to 10 minutes.
   - **Enable Immediate Write Data**: skips all digests and writes all data as it occurs.
6. Click **OK**.

Creating a Remote Storage Center Connection

Once a local (source) system is connected to a remote (target) system and the remote system is connected back to the local system, you can replicate volumes from an Initiator to a Target.

Note Storage Center automatically detects a Storage Center system connected via FC. Once recognized, remote FC systems appears in the System Tree.

iSCSI Remote Connections

iSCSI facilitates data transfers over IP networks. Unlike FC, which requires special-purpose cabling, iSCSI can be run over long distances using an existing IP network infrastructure.

A Remote Storage Center Connection connects an iSCSI port on one Storage Center to an iSCSI port on another Storage Center.

Note In the following text, *card* is synonymous with *port*.

- In Virtual Port mode, Remote Storage Center Connections are added to the Control Port of the Fault Domain that is being connected. When both systems are running in Virtual Port mode, connect the Control Ports of the Fault Domains.
- In non-Virtual Port mode, the Remote Storage Center Connections are added to each individual iSCSI IO Card. When both systems are running in non-Virtual Port mode, connect each iSCSI IO Card from each system to all IO Cards on the other system (and vice versa).
- In a mixed mode, when one system is running Virtual Port mode and the other is running non-Virtual Port mode, connect the Control Port to each individual IO Card from the non-Virtual Port mode system; connect the IO Cards from the non-Virtual Port system to the Control Port.

Adding a Remote System to iSCSI Ports

You can add a remote Storage Center system to a local system through the Storage Management menu. From the Storage Management menu, select, **System > Setup > Add iSCSI Remote Compellent Connections** menu or you can use the shortcut menu as described below.

1 Select an iSCSI folder. In a dual-controller system, it does not matter which of the two folders you select; connecting the remote system to the cards in one controller connects the remote system to all cards on both controllers.

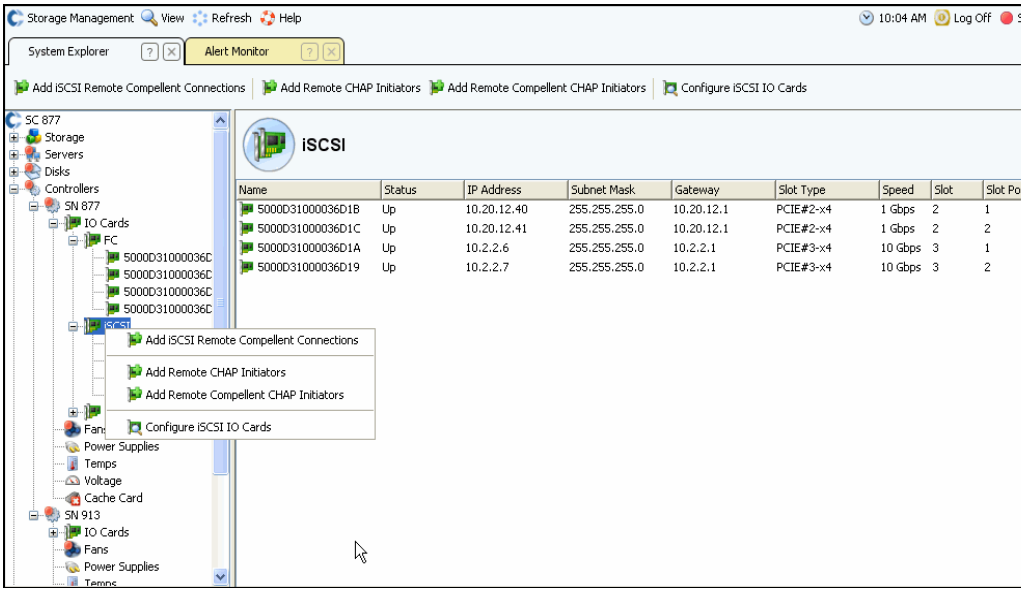


Figure 141. iSCSI Folder Shortcut Menu

2 From the shortcut menu, select **Add iSCSI Remote Compellent Connections**.

- If the local system has CHAP enabled, the configure CHAP window appears. If you are using CHAP, refer to Configuring Remote Connections Using CHAP on page 181.
- If the local system is not using CHAP, the Add iSCSI Remote Compellent Connections window appears, asking if NAT is configured.

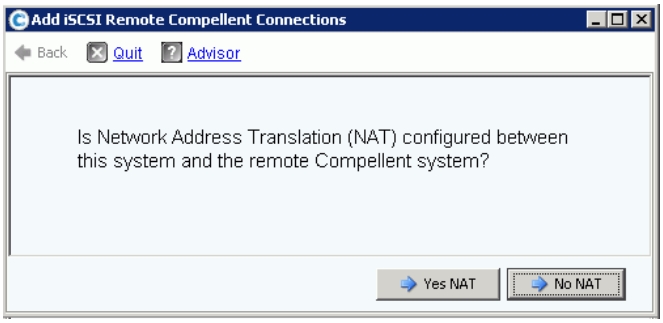


Figure 142. NAT

Note NAT is not available to systems using Virtual Ports, so if either the local or remote systems is using Virtual Ports, NAT is not enabled.

- If NAT is Enabled, go to <Number>.
- If NAT is not enabled, continue with <Number>.

3 If NAT is enabled:

a Click **Yes NAT**.

b Enter the NATed IP addresses and iSCSI Names for the remote Compellent iSCSI cards.

c Click **Continue**. The link speed window appears. Continue with Step 5 on page 175.

4 Click **No NAT**. The IP Addresses window appears.

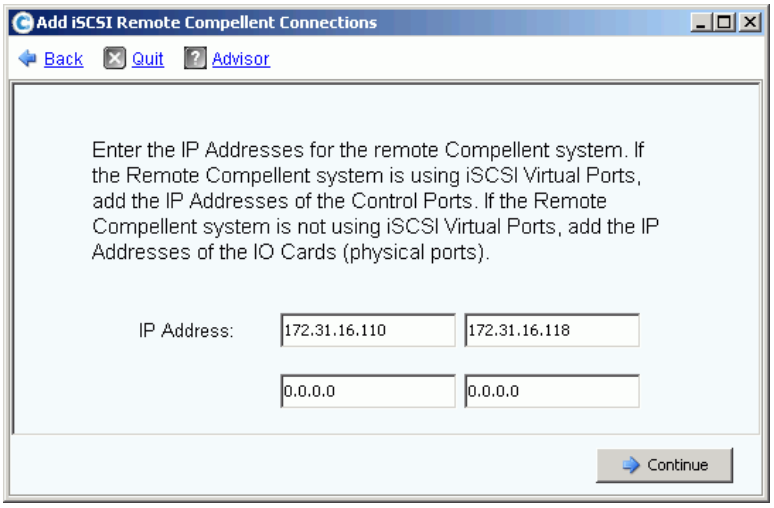

Add iSCSI Remote Compellent Connections
Back
Quit
Advisor
Enter the IP Addresses for the remote Compellent system. If the Remote Compellent system is using iSCSI Virtual Ports, add the IP Addresses of the Control Ports. If the Remote Compellent system is not using iSCSI Virtual Ports, add the IP Addresses of the IO Cards (physical ports).
IP Address:
172.31.16.110
172.31.16.118
0.0.0.0
0.0.0.0
Continue

Figure 143. Add iSCSI Remote Compellent Connections

5 Add the remote addresses:

- If the remote system is **using iSCSI Virtual Ports**, add the IP addresses of the Control Port.
- If the remote Storage Center system is **not using** iSCSI Virtual Ports, add the IP addresses of each IO Card.

6 Click **Continue**. The link speed window appears.

7 Enter the speed of the network link between this system and the remote Storage Center. system: T1, T3/100 MB, Gigabit, or greater.

8 Click **Continue** or **Advanced**.

a If you click Advanced, the **Advanced Options** window appears.

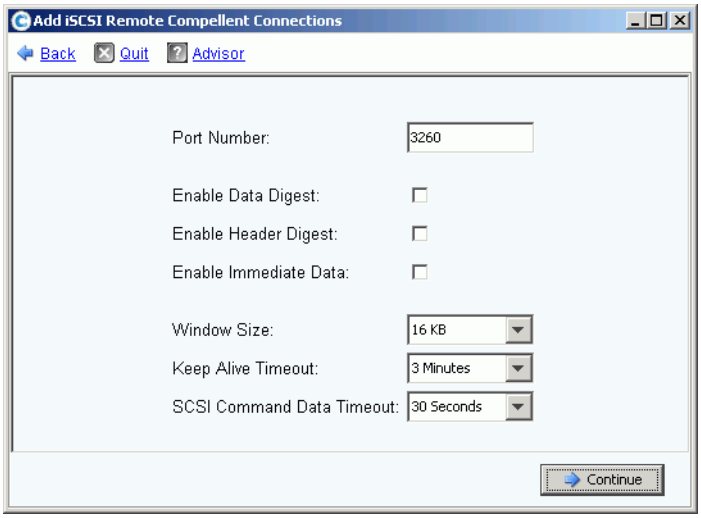


Figure 144. Advanced iSCSI Remote Connection

b Keep or change any of the following:

- Port number
- Enable or disable data digest
- Enable or disable header digest
- Enable or disable immediate data
- Select a window size, from 16KB to 2048 KB
- Select a keep alive time-out, from 3 seconds to 18 hours
- Select a SCSI command data time-out, from 3 seconds to 18 hours

c Click **Continue**. If the Link Speed window reappears. Click **Continue** again. The **Add Remote System** confirmation window appears.

9 Click **Add Now**. The local system now recognizes the remote system. But before the Remote System configuration is complete, you must log into the remote system and identify the local system.

10 To identify the local system to the remote system:

a Log into the remote system.

b Repeat the steps described in Adding a Remote System to iSCSI Ports on page 174.

Viewing Remote iSCSI Connections – Virtual Ports Not Enabled

1 In the system tree, select an iSCSI card. The iSCSI information window appears.

2 Click the **Remote Compellent Connections** tab. The **Remote Compellent iSCSI Connections** window appears.

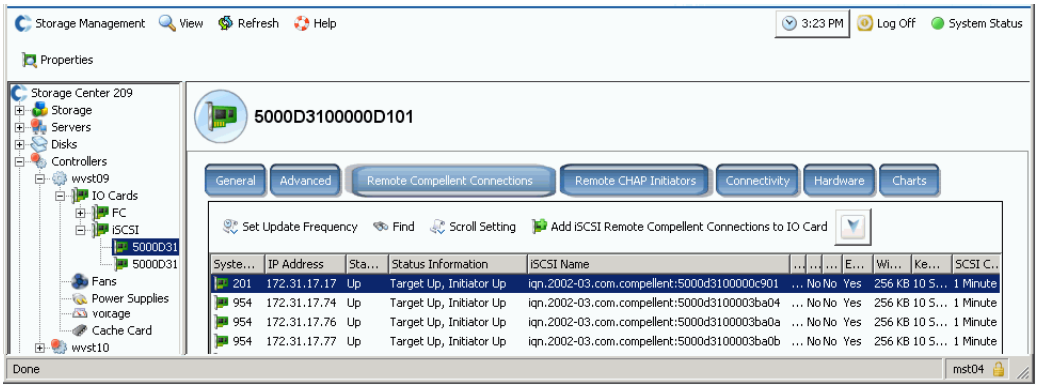


Figure 145. Non-Virtual Remote Compellent iSCSI Connections

3 For iSCSI remote Compellent connections, the system displays:

- **System Name**
- **IP Address**
- **Status**: **Up**, **Down**, or **Discovery**. **Discovery** is a user-created object used to configure the fully qualified remote connections that include the iSCSI name. Ignore the **Discovery** connection.
- Status information, including:
  - **Total List Is:**
  - **Target Up, Initiator Up**
  - **Target Up, Initiator Down**
  - **Target Up, No Initiator**
  - **Target Down, Initiator Up**
  - **Target Down, Initiator Down**
  - **Target Down, No Initiator**
  - **No Target, Initiator Up**
  - **No Target, Initiator Down**
  - **No Target, No Initiator**
- **iSCSI Name**
- Information that is added in the Advanced window (refer to Changing Advanced Remote Connection Properties on page 178)
- Information that is added in the Remote Connection IP address window
- Information that is added in the Remote iSCSI CHAP Secret window. Refer to Configuring Remote Connections Using CHAP on page 181.

Viewing Remote iSCSI Connections – Virtual Ports Enabled

1 In the system tree, select an iSCSI card. The iSCSI information window appears.

2 Click the **Remote Compellent Connections** tab. The **Remote Compellent iSCSI Connections** window that appears varies only slightly from the display for non-virtual ports.

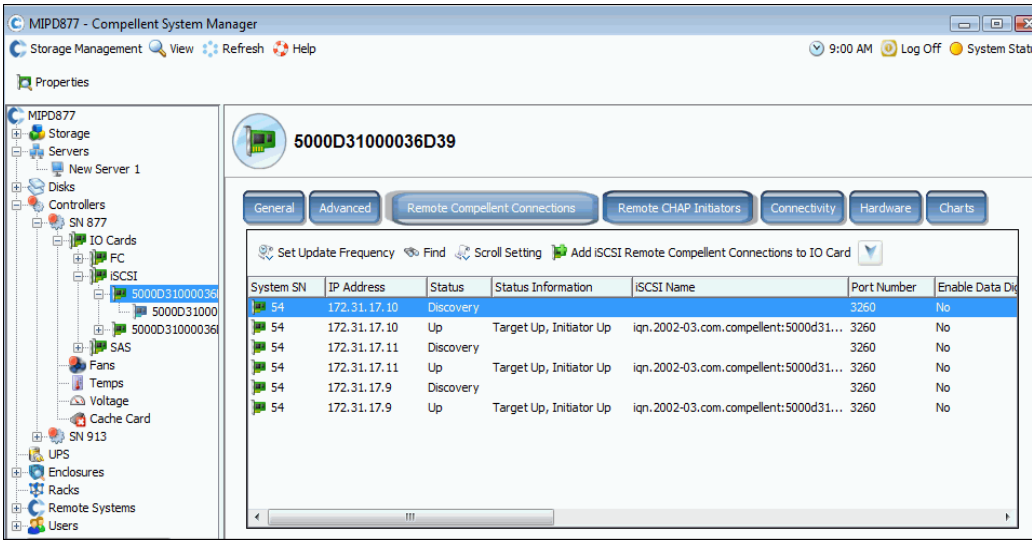


Figure 146. Virtual iSCSI Remote Compellent Connections

Changing Advanced Remote Connection Properties

1 In the system tree, select an iSCSI card. The iSCSI information window appears.

2 Click the **Remote Compellent Connections** tab.

3 From the shortcut menu, select **Properties**. The Properties window appears

4 Click **Advanced**. The **Advanced Remote Compellent Connection Properties** window appears.

5 Change any of the following:

- Port number
- Enable or disable data digest
- Enable or disable header digest
- Enable or disable immediate data
- Select a window size, from 16KB to 2048 KB
- Select a keep alive time-out, from 3 minutes to 18 hours
- Select a SCSI command data time-out, from 3 seconds to 18 hours

6 Click **OK**. The settings are changed.

Deleting iSCSI Remote Connections

1 In the system tree, select an iSCSI card. The iSCSI information window appears.

2 Click the **Remote Compellent Connections** tab.

3 From the shortcut menu, select **Delete**. The **Delete iSCSI Remote Connection** window appears.

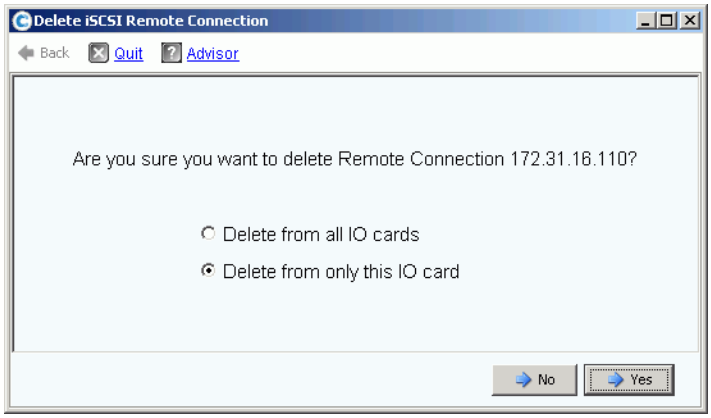


Figure 147. Delete iSCSI Remote Connection

4 Select delete from all IO cards or just the selected IO card.

5 Click **Yes**. Connection is deleted.

Viewing Remote Connection Properties

1 In the system tree, select an iSCSI card. The iSCSI information window appears.

2 Click the **Remote Compellent Connections** tab.

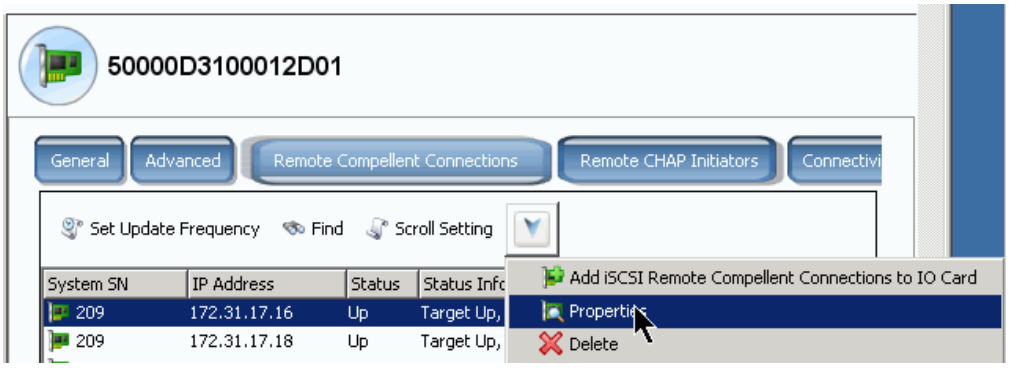


Figure 148. iSCSI Card Shortcut Menu

3 From the shortcut menu, click **Properties**. The **Remote Connection General Properties** window appears.

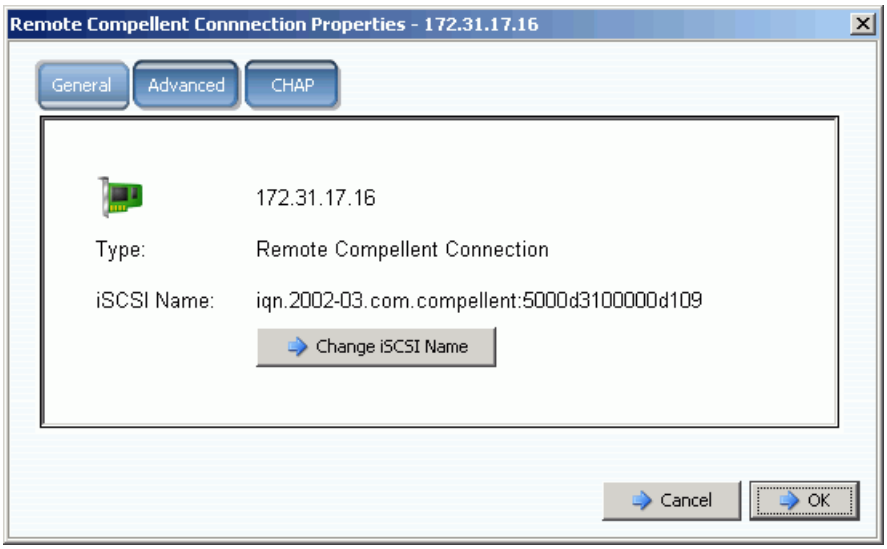


Figure 149. Remote Compellent Connection Properties

Changing a Remote iSCSI Name

This would be an unusual change. In general there is no good reason to do it. The iSCSI name can be changed if you are using NAT and the iSCSI name was incorrect or you were previously using NAT and no longer want to use it. You can blank out the name.

To change a remote connection iSCSI name

1. View properties, as described in Viewing Remote Connection Properties on page 179. Click **Change iSCSI Name**.
2. Enter a new name.
3. Click **OK**. The system warns you that this change will disrupt iSCSI traffic currently in progress. Click **Yes (Save Changes)**. The name is changed.

Configuring Remote Connections Using CHAP

Challenge Handshake Authentication Protocol (CHAP) is an iSCSI security option that provides connection authentication based on secrets (essentially passwords) that are exchanged when a connection is established.

Configuring Remote Storage Center Connections using CHAP consists of the following steps:

1. Enabling CHAP in each system.
2. Add Remote Compellent Connection from System 1 to System 2.
3. Add Remote Compellent Initiator from System 2 to System 1
4. Add Remote Compellent Connections from System 2 to System 1.
5. Add Remote Compellent Initiator from System 1 to System 2.

Note Once CHAP is enabled (Step 1), Steps 2 through 5 can be done in any order.

Remember the following:

- If Virtual Ports are enabled, CHAP is enabled in the Properties window of the Control Port.
- In a legacy system (one in which Virtual Ports are not enabled), CHAP is enabled in the Properties window of each iSCSI IO port.
- The difference between adding a Remote CHAP Initiator and a Remote Storage Center CHAP Initiator is simply that Storage Center enters the first part of the Compellent IQN name in the Remote Compellent Initiator window.
- If you add an iSCSI Remote Connection or Remote Compellent CHAP Initiator from an iSCSI folder, the connection or initiator is added for all ports. You can select an individual card (in legacy mode) or Control Port (in Virtual Port mode) and add a remote iSCSI connection or initiator only to that port.

Displaying Remote CHAP Initiators

Before configuring new CHAP initiators, you can view existing remote CHAP initiators.

- In a legacy system (one in which Virtual Ports are not enabled), Remote CHAP Initiators are on the iSCSI IO card.
- In a system with Virtual Ports, select the Control Port.

From the shortcut menu, select **Properties**. The Properties window displaying the Remote CHAP Initiator tab appears. This tab displays information about existing CHAP initiators.

Adding a Remote CHAP Initiator

1 In the system tree, select the iSCSI card folder.

2 From the shortcut menu, select **Add Remote CHAP Initiators**. The Add iSCSI Remote CHAP Initiators window appears.

3 Enter the CHAP Name and CHAP Secret of the Remote CHAP Initiator to be added to the Control Port or IO Card.

Server CHAP Secret is required only if using Bi-Directional Authentication.

4 Click **Add Now**. The Remote CHAP Initiator is added.

Enabling CHAP

Note CHAP authentication is enabled on individual IO Cards in legacy port mode and on Control Ports in Virtual Port mode.

1 In the system tree, select a port.

- In Virtual Port mode, select the iSCSI Control Port.
- In non-Virtual Port mode, select an iSCSI card.

2 From the shortcut menu, select **Properties**. The **IO Card Properties** window appears.

3 Click on the **CHAP** tab on this window. The CHAP IO information window appears.

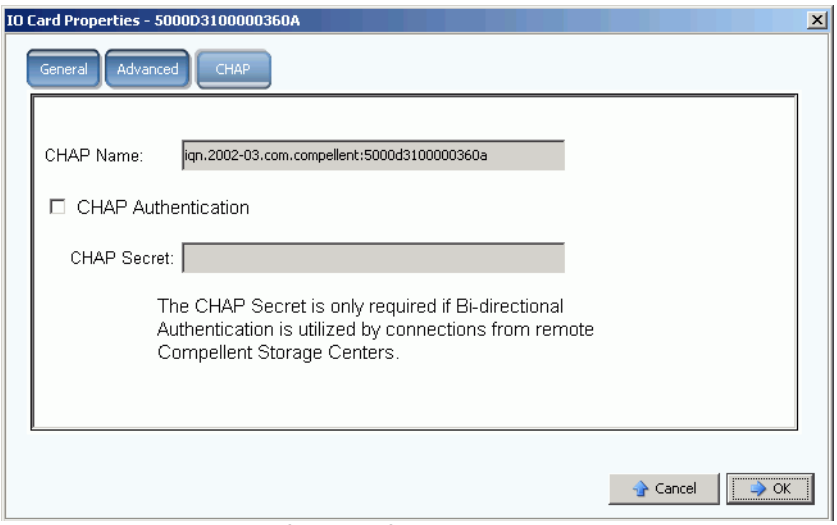


Figure 150. CHAP IO Card Properties

Note The CHAP name is an iSCSI Qualified Name (IQN).

4 Check **CHAP Authentication**. The CHAP Secret name is no longer grayed-out.

5 For bi-direction authentication, enter any 12-character alphanumeric secret (similar to a password) in the CHAP Secret field.

Note If you are using a QLogic QLA4010, Storage Center **requires** a CHAP Secret. If you leave the CHAP Secret blank when configuring a QLA4010 card, the system asks you to enter a CHAP secret.

6 Click **OK**. The system warns you that saving these changes disrupts iSCSI traffic.

7 Click **(Save Changes)** to save your changes. Or click **No (Return)** to abandon your changes.

Creating CHAP Connections

Add Remote Compellent Connection from System 1 to System 2

In System 1 (legacy mode):

1 Log into a Storage Center system in which you enabled CHAP.

2 Select an iSCSI folder. In a dual-controller system, it does not matter which of the two disk folders you select; connecting the remote system to the cards in one controller connects the remote system to all cards on both controllers.

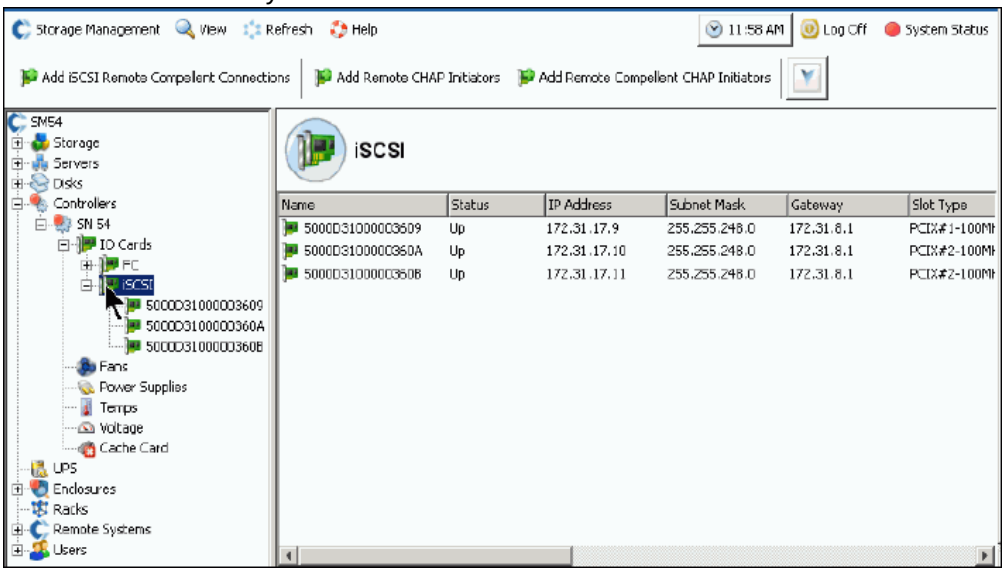


Figure 151. Select iSCSI Folder

3 From the shortcut menu, select **Add iSCSI Remote Compellent Connections**. The **Add iSCSI Remote Compellent Connections** window appears.

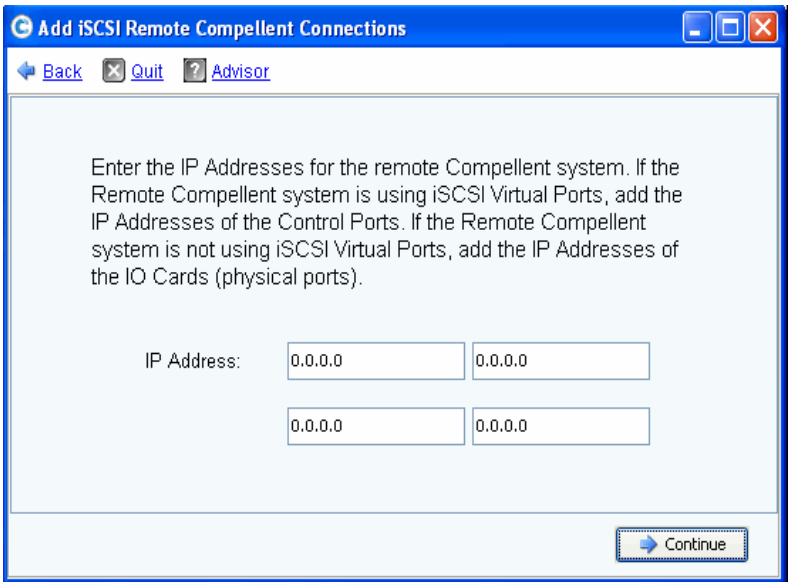

Add iSCSI Remote Compellent Connections
Back
Quit
Advisor
Enter the IP Addresses for the remote Compellent system. If the Remote Compellent system is using iSCSI Virtual Ports, add the IP Addresses of the Control Ports. If the Remote Compellent system is not using iSCSI Virtual Ports, add the IP Addresses of the IO Cards (physical ports).
IP Address:
0.0.0.0
0.0.0.0
0.0.0.0
0.0.0.0
Continue

Figure 152. Add iSCSI Remote Compellent Connections window

Note If the Remote Compellent system is using iSCSI Virtual Ports, add the IP Addresses of the Control Ports. If the Remote Compellent system is not using iSCSI Virtual Ports, add the IP Addresses of the IO Cards (physical ports).

4 Add the **IP Address** of the Control Port of System 2. The IP Address appears in the iSCSI folder containing the Control Port.

5 When you have entered the IP address and CHAP name of System 2, click **Continue**. An additional Add iSCSI Remote Compellent Connections window appears.

6 On the second window, enter the **CHAP Name** of the Compellent port on System 2.

7 Enter a **Target Secret** for the remote connection. The Target Secret must be at least 12 alphanumeric characters in length. It is the primary secret used in the connection initiation process.

8 Enable or disable **Bi-directional Authentication**.

Note The Remote Compellent CHAP Initiator secret on the remote Storage Center must match the Target Secret on the local Storage Center.

9 Select **Continue**.

10 Select a link speed.

11 Click **Continue**. The CHAP verification window appears.

12 Click **Add Now.** In System 1, the Control Port IP address and system name of System 2 now appear in the Remote Compellent Connections window off all the iSCSI cards.

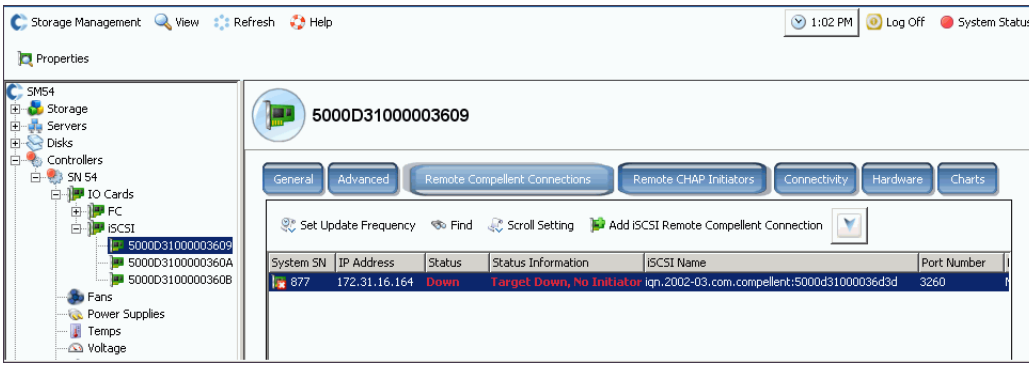


Figure 153. Remote Connections Verification

Add Remote Compellent Initiator from System 2 to System 1

To add the remote Compellent Initiator to System 2 (Virtual Ports enabled):

1 Log in to System 2.

2 Select an iSCSI folder. In a dual-controller system, it does not matter which of the two disk folders you select; connecting the remote system to the cards in one controller connects the remote system to all cards on both controllers.

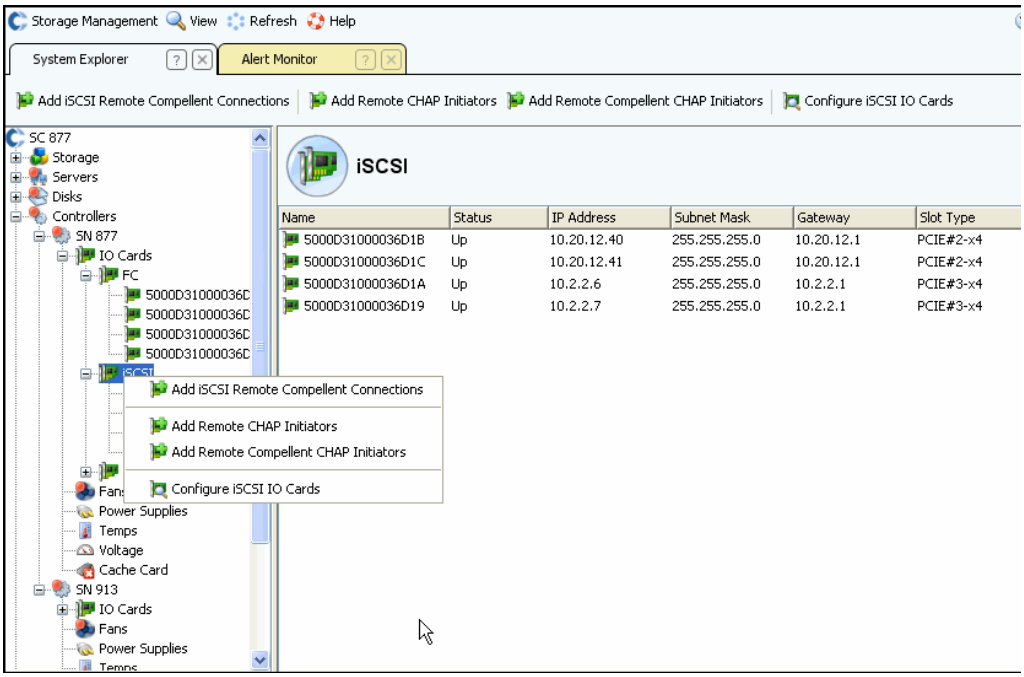


Figure 154. iSCSI Folder Shortcut Menu

3 From the shortcut menu, select **Add Remote Compellent CHAP Initiators**. The **Add Remote Compellent CHAP Initiators** window appears.

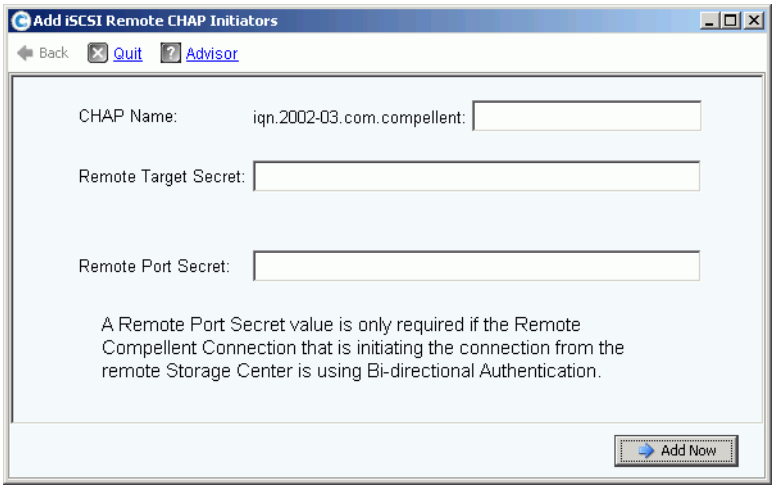

Add iSCSI Remote CHAP Initiators
Back
Quit
Advisor
CHAP Name:
iqn.2002-03.com.compellent:
Remote Target Secret:
Remote Port Secret:
A Remote Port Secret value is only required if the Remote Compellent Connection that is initiating the connection from the remote Storage Center is using Bi-directional Authentication.
Add Now

Figure 155. Add iSCSI Remote CHAP Initiator

4 Add the System 1 **CHAP Name** that appeared in the CHAP properties window. To finish the CHAP Name, you can easily copy the iSCSI Alias from the IO Card or Control Port.

5 Add the **Target Secret** in the **Remote Target Secret** field that was in Step 7 on page 184.

- If you are not using Bi-Directional CHAP, click **Add Now.**
- If you are using Bi-Directional CHAP, continue with <Number>, below.

6 If you are adding a Remote CHAP Initiator to a card that uses Bi-Directional authentication, add the CHAP Secret for that card. The CHAP Name and CHAP Secret appear in the Advanced Information for the initiator card.

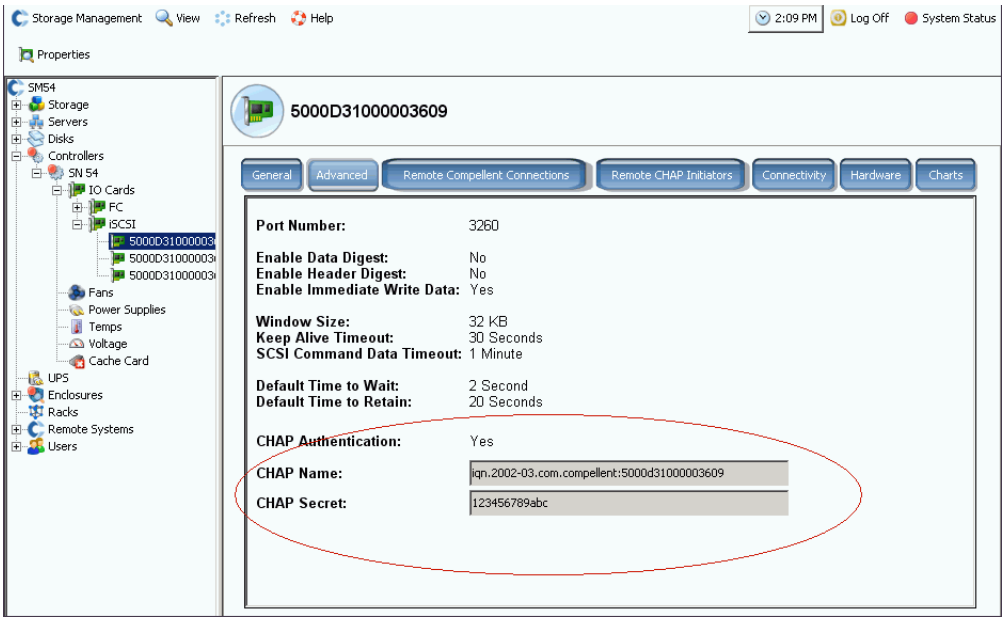


Figure 156. Advanced Information for Card with CHAP Secret

a Repeat <Number> through Step 3 on page 185. The Add Remote Compellent CHAP Initiators window appears.

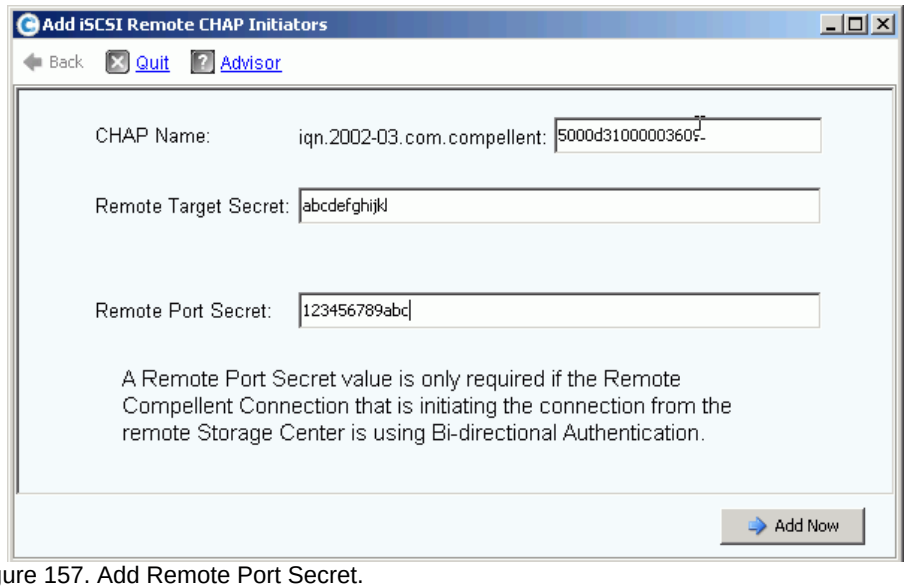


Figure 157. Add Remote Port Secret.

b Enter the **CHAP Name**, **Remote Target Secret**, and **Remote Port Secret** for a card that was configured with a CHAP secret.

c Click **Add Now**.

Add Remote Compellent Connections from System 2 to System 1

While you are in System 2 (Virtual Port Mode):

1 Select an SCSI folder.

2 From the shortcut menu, select **Add iSCSI Remote Compellent Connections**. The **Add iSCSI Remote Compellent Connections** window appears.

3 Add the **IP address** of a System 2 card.

4 Click **Continue**.

5 Add the **CHAP Name** of the System 1 card.

6 Add **CHAP Secret**.

7 Click **Continue**.

8 Select a link speed.

9 Click **Continue**. The Verification window appears.

10 Click **Add Now**.

Note If you are connecting to a system in legacy mode, add a remote Compellent Connection for each card.

Add Remote Compellent CHAP Connection with Bi-Directional Authentication

To add a remote Compellent CHAP connection with bi-directional authentication:

1. Repeat Steps 1 through 6, above.
2. Enable Bi-Directional Authentication.
3. Continue with Steps 7 through 10, above.

Add Remote Compellent Initiator from System 1 to System 2

Complete the circle by adding a remote Compellent initiator to System 1 (legacy mode):

1. If you have not already done so, log into System 1.
2. Select an SCSI folder. In a dual-controller system, it does not matter which of the two disk folders you select; connecting the remote system to the cards in one controller connects the remote system to all cards on both controllers.
3. From the shortcut menu, select **Add Remote Compellent CHAP Initiators**. The Add iSCSI Remote CHAP Initiators window appears.
4. Enter the **CHAP Name** of the remote IO card (for legacy mode) or Control Port (for Virtual Port mode).
5. Enter the **Remote Target Secret**.
6. Add the **Remote Port Secret**.

Note In our example, System 1 is in legacy (non-Virtual Port mode). We connected three cards from System 1 to System 2. One of the three cards uses Bi-Directional Authentication. In adding a Remote CHAP Initiator from System 1 to System 2, we had to add the Remote Port Secret, even though only one of the cards will use Bi-Directional Authentication.

7. Click **Add Now**.

Disabling CHAP

Note If you disable CHAP, you must re-do all Remote Compellent Connections.

1. Select a Control Port or iSCSI card. From the shortcut menu, select **Properties**.
2. Click the **CHAP** tab.
3. Uncheck **CHAP Authentication**.
4. Click **OK**.

Changing Remote Compellent Connections CHAP Settings

1. In the system tree, select an iSCSI card. The iSCSI information window appears.
2. Click the **Remote Compellent Connections** tab.
3. At the top of the window, click **Properties**. The properties window appears
4. Click **CHAP**. The CHAP authentication window appears.
5. Select or clear **CHAP Authentication Enabled**. If it is enabled, enter the Remote IO card secret.
6. Select or clear **Perform Mutual Authentication**. If you select mutual authentication, enter the connection secret and the remote connection secret.

Deleting Remote CHAP Initiators from a Servers

1. In the system tree, select an iSCSI card.
2. From the shortcut menu, select **Remote CHAP Initiators**.
3. At the top of the window, click **Delete**. The system asks you to confirm.
4. Click **Yes**. The CHAP initiator is deleted.

Viewing SAS Cards

Serial Attached SCSI (SAS) cards use arbitrated bus technology. Each port contains four separately-arbitrated lanes. Each lane can perform concurrent IO transactions at 3 Gb/sec. This provides an aggregate port rate of 12 Gb/sec.

A SAS card connects to a SAS enclosure. It is a back-end only connection.

Viewing SAS Folders

To view a list of SAS adapter cards on a controller

In the system tree, expand controllers and IO cards to view the SAS folder. The SAS status window appears. The folder displays

- **Name**
- **Status**
- **Slot Type**
- **Speed**
- **Phy Lane Status**
- **Slot**
- **Slot Port**
- **Network**
- **Usage**
- **Device Name**
- **Description**
- **World Wide Name**

Viewing SAS General IO Card Information

In the system tree, select a SAS port.

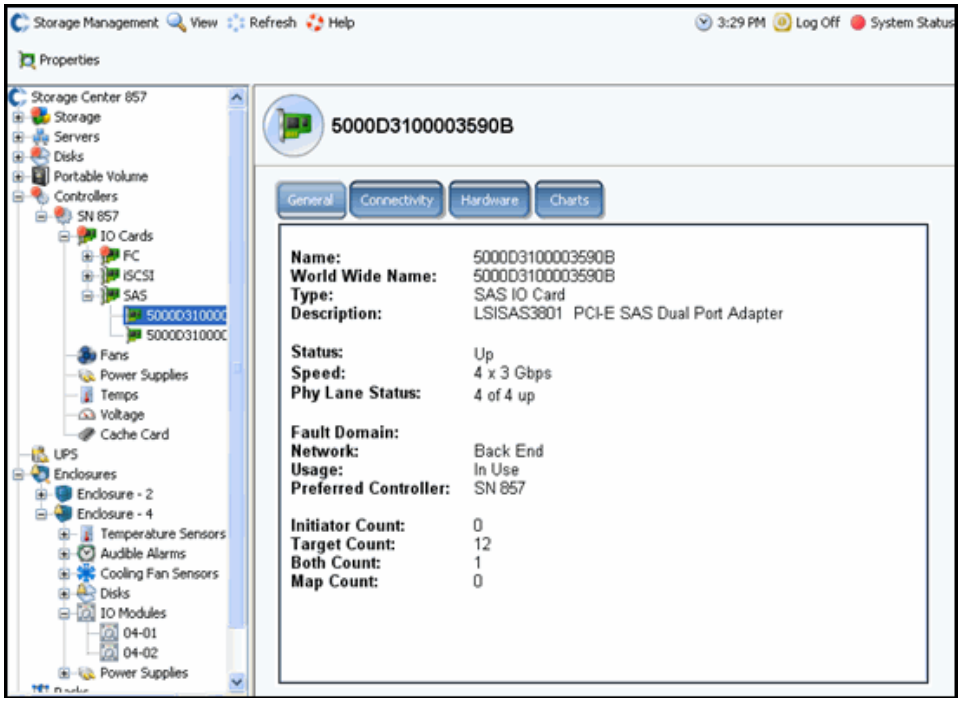


Figure 158. SAS IO Card General Information

The system displays General SAS card information including:

- **Name**
- **World Wide Name (WWN)**
- **Type**: SAS IO Card
- **Description**: of the port adapter
- **Status**: **Up, Down**, or **Reserved**
- **Speed of IO**: There are 4 lanes on each port. Each lane supports 3 Gbps.
- **Fault Domain:** Blank because this is a back-end connection only
- **Phy Lane Status**: Reports the number of lanes on each port that are up.
- **Network**: Back End or Unknown
- **Usage**: In use
- **Preferred Controller**: When ports are rebalanced, choose a preferred controller
- **Initiator Count**: 0 because this is back-end
- **Target Count**: Number of active disk drives in this system
- **Both Count:** Back-end connection
- **Map Count**: Number of volumes mapped to this system

Viewing SAS IO Card Connectivity Status

1 In the System Tree, select a SAS card.

2 In the SAS IO card window, select the Connectivity tab. The SAS IO Card Connectivity window appears:

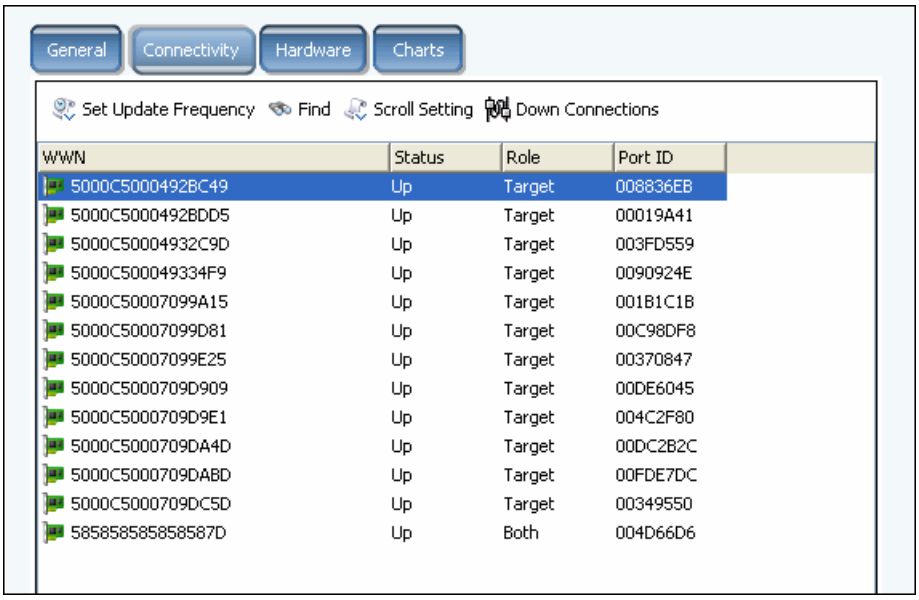


Figure 159. SAS IO Card Connectivity

The window displays:

- **World Wide Name**
- **Status**
- **Role**
- **Port ID**

Viewing Individual SAS Ports

1 In the System Tree, select a SAS port.

2 In the SAS IO port window, select the Hardware tab. The SAS IO Port Hardware window appears:

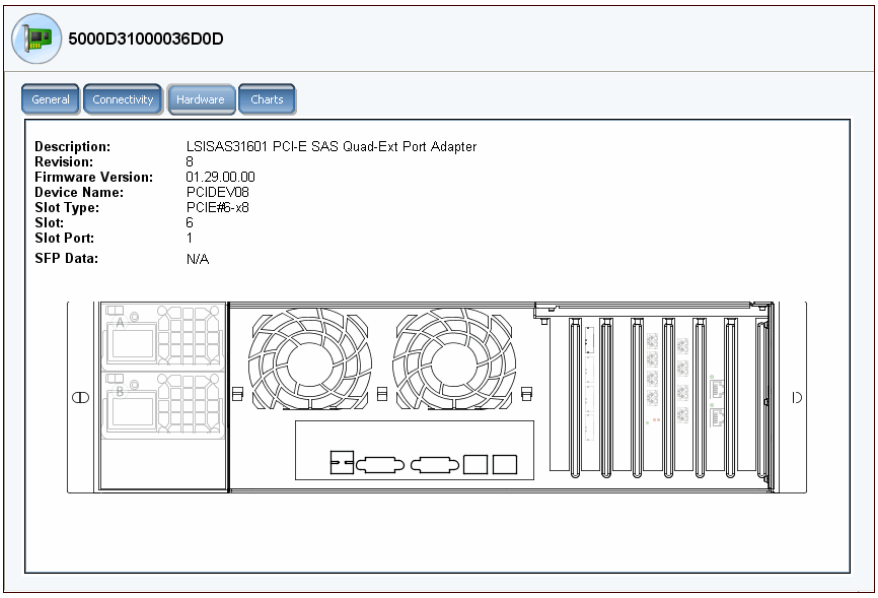


Figure 160. SAS Hardware

The window displays:

- **Description**: of the port
- **Revision:** of the port
- **Firmware Version**
- **Device Name**
- **Slot Type**: such as PCI-E
- **Slot**: numbered from left (6) to right (1)
- **Slot Port**: numbered from top (1) to bottom (4)
- **SFP Data**: data sent by Small Form-factor Pluggables (SFPs allow network operators to connect different interface types to the same network equipment via an SFP port.)

3 The port location is highlighted. Mousing over the port displays port name and type. Right-click to open the shortcut menu, from which you can view Properties and status.

Viewing SAS IO Card Charts

To view SAS IO card performance charts

1. In the System Tree, select a SAS port.
2. In the SAS IO port window, select the **Chart** tab. The SAS chart appears.

Rebalancing Local Ports

Storage Center balances data storage between controller ports. If a controller has been added or taken offline, the ports can become unbalanced.

1. In the system tree, click the Controllers folder. The system lists the controllers and displays the local port condition as Unbalanced.
2. Select the Controller folder icon.
3. From the shortcut menu, select **Rebalance Local Ports.**

To clear the automatic reminder from System Manager to rebalance local ports, in the Rebalance Local Ports window, select or clear Check for unbalanced local ports at Startup.

Note System access is restricted while the rebalancing process is in progress.

7 System Management

Setting Up a Storage Center 196
Viewing Licensed Applications 213
Configuring System Access via IP Filtering 214
Viewing Disk Space Usage Summary 220
Viewing System Properties 229
Finding Unmanaged Hardware 237
Phoning Home 241
Responding to the Alert Monitor 244
Monitoring Storage Space 247
Changing the Storage Alert Threshold 248
Adding Space 249
Adding a Controller 250
Shutting Down and Restarting 252
Shutting Down and Restarting 252
Upgrading Storage Center Software 253

Setting Up a Storage Center

The Storage Center Storage Management menu **System > Setup** options offer many features that control basic Storage Center functionality.

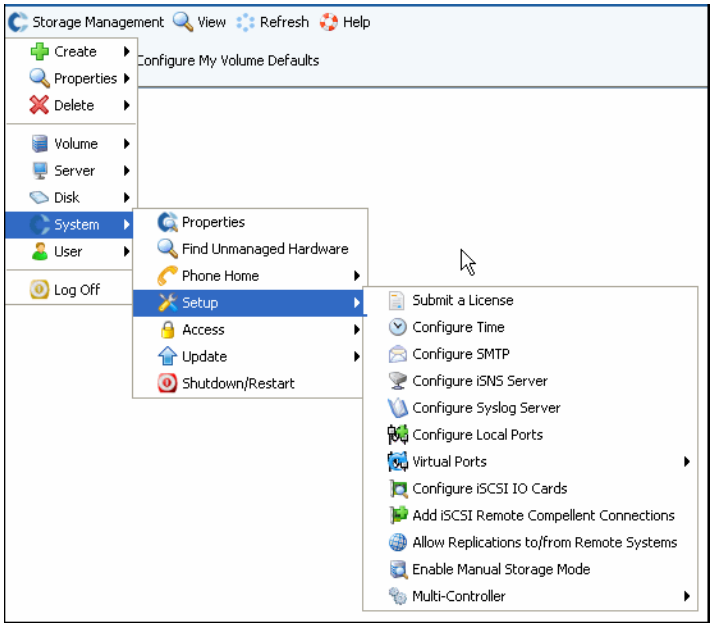


Figure 161. System Setup Menu

From this menu you can:

- Set configuration parameters that were skipped during initial setup
- Reapply settings
- Change initial installation parameters

Submitting a License

If you add applications, or increase the number of disks licensed for your system, you may need to submit a new license. The license is emailed to you from your system provider. Save the license file to a host system.

To submit a license

1. From the Storage Management menu, choose **System > Setup > Submit a License**.
2. On the **Select License File** window, browse to the license file, indicated by a **.lic** extension.

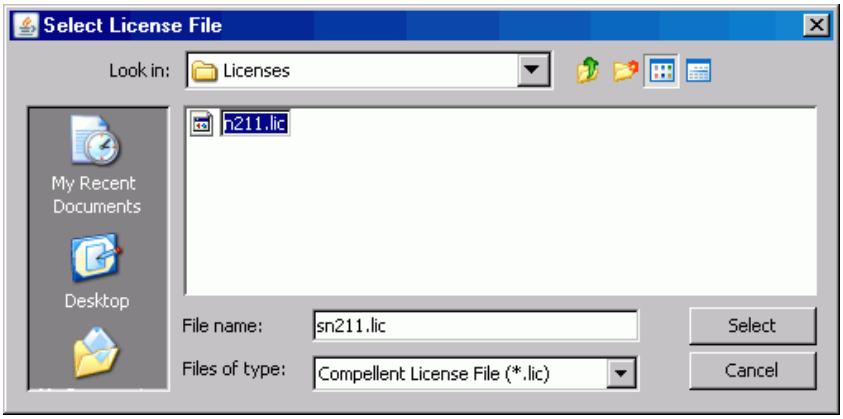


Figure 162. Select License File WIndow

3 Select the license file. Click **Load License**. System Manager notifies you if the license submission was successful.

Configuring Time

1 From the Storage Management menu, select **System > Setup > Configure Time**. The **Time Settings** window appears.

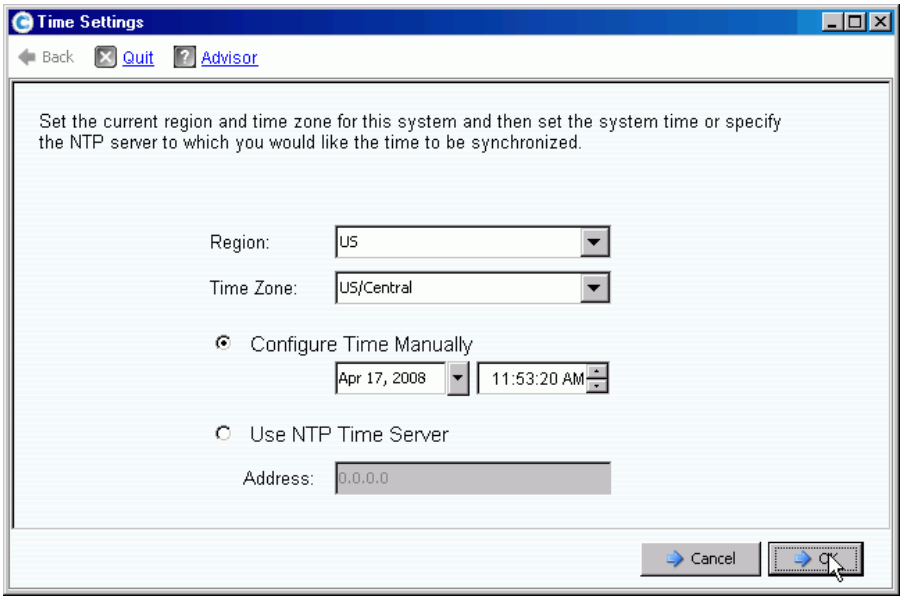


Figure 163. Time Settings Window

2 Select the region and time zone for the system from the **Region** and **Time Zone** lists.

Note The options you see may vary from those shown above. If a NTP time server is not available, select **Configure Time Manually** to set the system date and time.

3 If a NTP server is available:

a Select **Use NTP Time Server**.

b Enter the **IP Address** or **domain name** of the time server. If a NTP time server was previously configured, the Last NTP time server update field displays the time of the last update. If a NTP Server has not been entered, the Last NTP time server update field does not appear.

4 Click **OK** to save the changes. If a NTP time server is set, Storage Center performs a test to make sure updates are being received from the time server.

Configuring SMTP

Simple Mail Transfer Protocol (SMTP) is a protocol for sending email messages between servers. Storage Center uses SMTP to send automated emails to an administrators account when management is required.

To configure SMTP

1 From the Storage Management menu, choose **System > Setup > Configure SMTP**. The SMTP window appears.

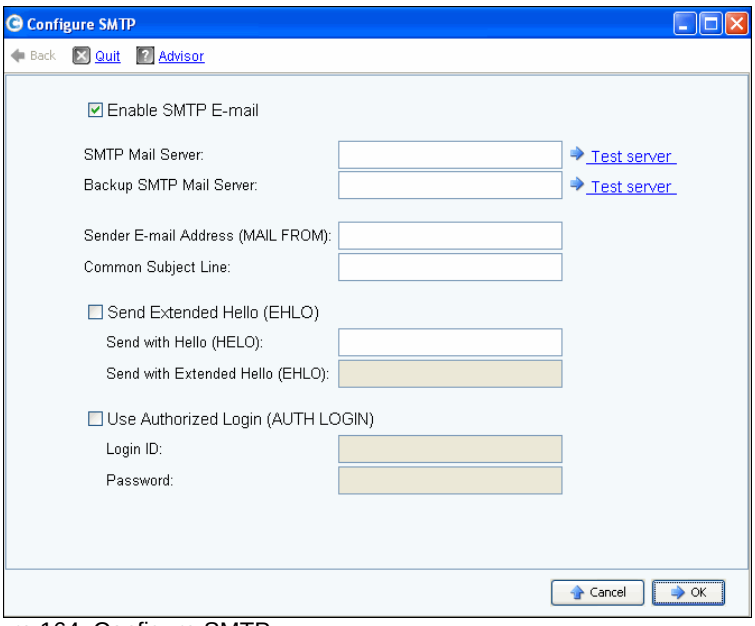


Figure 164. Configure SMTP

2 Enter the IP address or fully-qualified domain name of the SMTP mail server in the SMTP Mail Server box.

3 Enter the IP address or fully-qualified domain name of the backup SMTP mail server in the Backup SMTP Mail Server box.

4 Click **Test server** to test the connection(s).

5 Enter a common subject line for all emails from Storage Center.

6 Enter the email address of the sender in the Sender E-mail Address (MAIL FROM) box, and a common subject line for all emails from Storage Center in the Common Subject Line box.

7 Check the **Send Extended HELO (EHLO)** box to configure use of extended hello for mail system compatibility. Instead of beginning the session with the HELO command, the receiving host issues the HELO command. If the sending host accepts this command, the receiving host then sends it a list of SMTP extensions it understands, and the sending host then knows which SMTP extensions it can use to communicate with the receiving host. Implementing Extended SMTP (ESMTP) requires no modification of the SMTP configuration for either the client or the mail server.

8 Check the **Use Authorized Login (AUTH LOGIN)** and complete the Login ID and Password boxes if the email system requires the use of an authorized login.

9 Click **OK** to save changes.

Configuring iSNS Server

iSNS is analogous to DNS. Just as DNS provides name service for servers and workstations in a LAN, an iSNS server provides name service for initiators and targets in a SAN. This makes the task of managing the storage network easier because data is centralized on a server.

The iSNS protocol facilitates automated discovery, management, and configuration of iSCSI and FC devices on a TCP/IP network. The protocol provides intelligent storage discovery and management services comparable to those found in FC networks, allowing an IP network to function in a similar capacity as a SAN. Because of its ability to emulate FC fabric services, iSNS also facilitates a seamless integration of IP and FC networks and manages both iSCSI and FC devices. Using iSNS thereby provides value in a Storage Center system.

To configure the Internet Storage Name Service (iSNS)

1 From the Storage Management menu, choose **System > Setup > Configure iSNS Server**. The **Configure iSNS Server** window appears.

2 Enter the **IP address** of the server.

3 Click **OK**.

Configuring Syslog Server

All syslog messages have a logging facility, which is the location where messages are sent. The syslog daemon sends messages based on the configured facility. If no facility is specified, **local0** is the default outgoing facility. Follow these steps to configure a syslog server and logging facility.

To configure the syslog server

1 From the Storage Management menu, choose **System > Setup > Configure Syslog Server**. The **Configure SysLog Server** window appears.

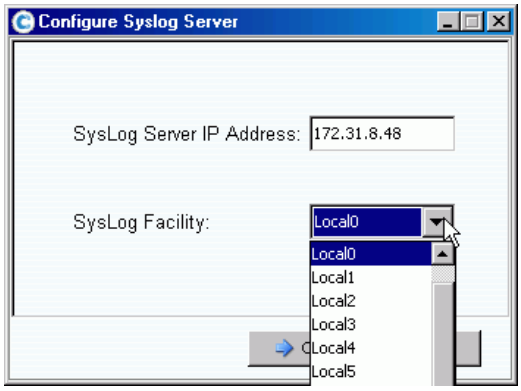


Figure 165. Configure SysLog

2 Enter the **IP address** of the syslog server in the **SysLog Server IP Address** box.

3 From the drop-down box, choose the **Syslog Facility** to where the messages are sent.

4 Click **OK**.

Configuring Local Ports

The **Configure Local Ports** wizard simplifies configuration and allows you to configure Legacy Mode and Virtual Port Mode local ports through a single wizard.

1 From the Storage Management menu, choose **System > Setup > Configure Local Ports**.

The **Configure Local Ports** wizard appears. The wizard displays tabs for each transport type (FC, iSCSI, and SAS) present on the system. Information presented on tabs varies by operational mode and by transport type. Operational mode is displayed in the lower left of the window.

Note Sample screens for transport types are shown in Figure 166 on page 202 through Figure 168 on page 203.

2 Click the tab for the transport type you want to view. Information displayed varies based on transport type and mode:

- **Status**: Can be Up or Down.
- **Slot/Port**: Slot 1 is to the right. Port 1 is the top port on an HBA and port 4 is the lowest.
- **Magnifying glass icon**: click to open the Local Port Location window that displays information about the port and shows a physical view of the IO cards.
- **Purpose**, **Fault Domain**, and **User Alias** are described in User Configurable Columns on page 203.
- **World Wide Name**: is a unique identifier which identifies a particular FC, iSCSI, or SAS target.
- **Speed**: displays port speed.
- **Map Count**: displays the number of volumes that have been mapped to a server. Modifying port configuration after volumes have been mapped to servers may cause those volumes to go off-line. (Not displayed for SAS ports in Legacy Mode.)
- **Initiator Count**: Number of remote ports with a role of *initiator.*
- **Target Count**: Number of remote ports with a role of *target* (For FC and SAS, disks show up as targets.)
- **Both Count:** Number of ports that can both send and receive data (such as a second Storage Center acting as a server).
- **Enclosure Connected**: Can be Yes or No and is displayed for FC ports only – Virtual Ports and Legacy Modes. Setting the value to Yes prevents the Configure Local Ports wizard from setting front-end values on FC ports attached to an enclosure.
- **Slot Type**: PCI-X or PCI-E.

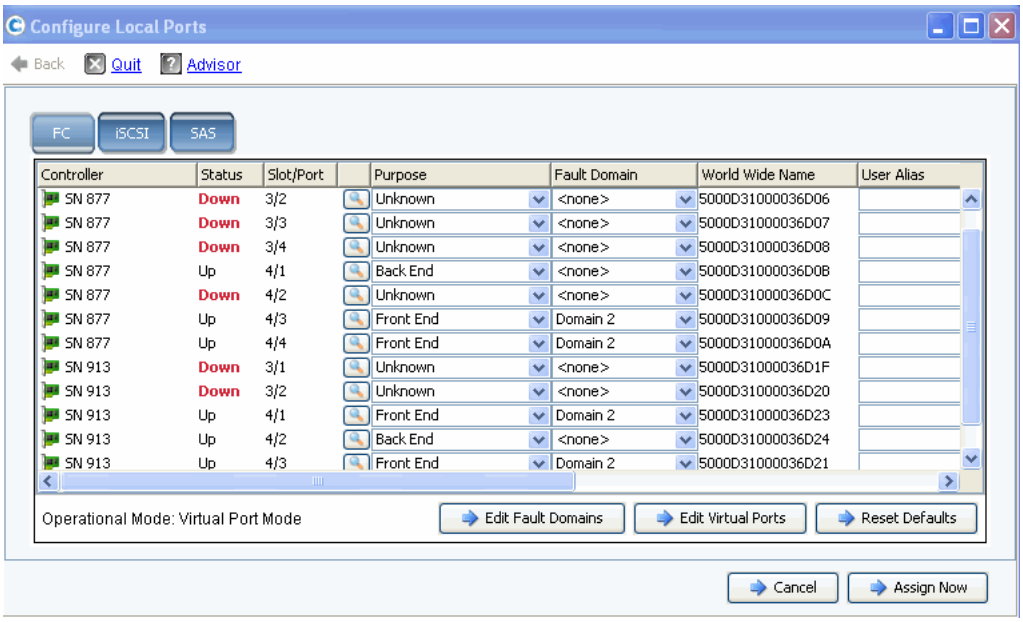


Figure 166. Configure Local Ports – FC Tab / Virtual Port Mode

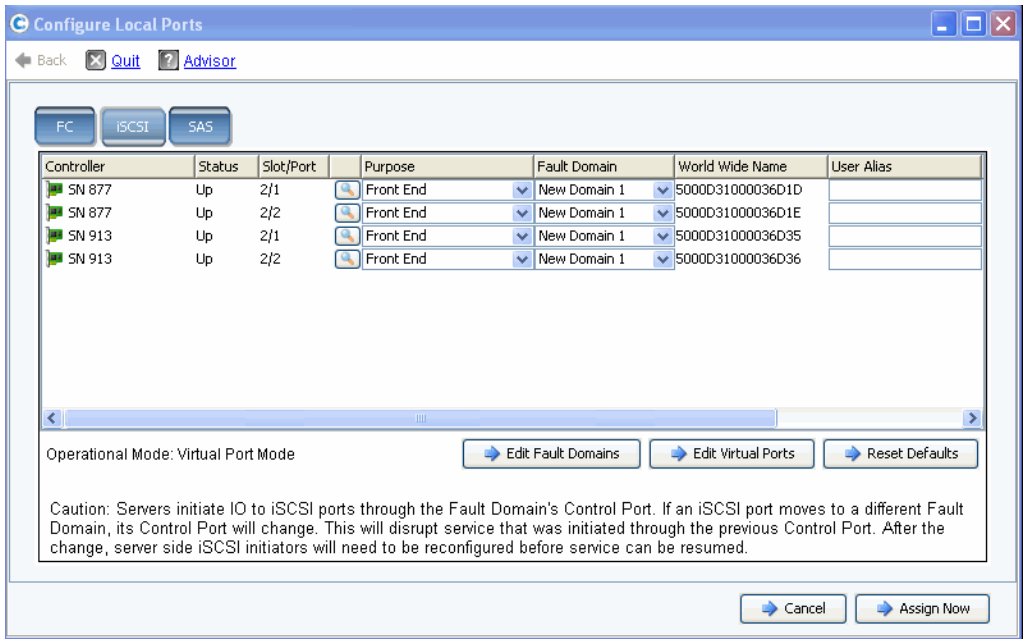

Configure Local Ports
Back
Quit
Advisor
FC
iSCSI
SAS
Controller
Status
Slot/Port
Purpose
Fault Domain
World Wide Name
User Alias
SN 877 Up 2/1 Front End New Domain 1 5000D31000036D1D
SN 877 Up 2/2 Front End New Domain 1 5000D31000036D1E
SN 913 Up 2/1 Front End New Domain 1 5000D31000036D35
SN 913 Up 2/2 Front End New Domain 1 5000D31000036D36
Operational Mode: Virtual Port Mode
Edit Fault Domains
Edit Virtual Ports
Reset Defaults
Caution: Servers initiate IO to iSCSI ports through the Fault Domain's Control Port. If an iSCSI port moves to a different Fault Domain, its Control Port will change. This will disrupt service that was initiated through the previous Control Port. After the change, server side iSCSI initiators will need to be reconfigured before service can be resumed.
Cancel
Assign Now

Figure 167. Configure Local Ports – iSCSI Tab / Virtual Port Mode

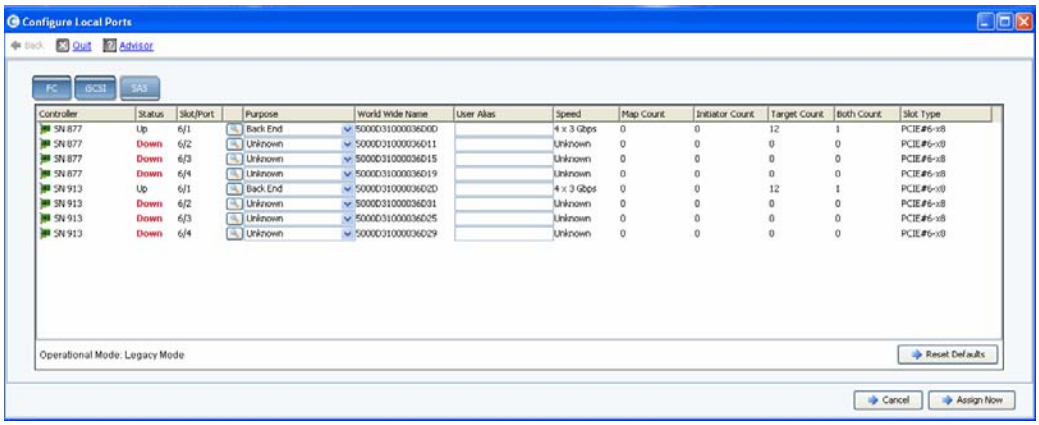


Figure 168. Configure Local Ports – SAS Tab / Legacy Mode

User Configurable Columns

The following columns are user configurable on all tabs:

- **Purpose**: Valid values for port purpose vary by transport type and by operational mode.

Port Purpose	Transport Type	Legacy Operational Mode
Unknown	All	Port purpose is not yet defined, or the port is unused.
Front End Primary	FC and iSCSI	Port is connected to servers and is used for the server IO path.
Front End Reserved	FC and iSCSI	Port is connected to servers and used as a failover path. Only used for dual-controller Storage Center systems.
Back End	FC and SAS	Port is connected to disk enclosures.
Direct Connect	FC and iSCS	Port is directly connected to another Storage Center controller and is used for inter-controller communication.

Port Purpose	Transport Type	Virtual Port Operational Mode
Unknown	FC and iSCSI	Port purpose is not yet defined, or the port is unused.
Front End	FC and iSCSI	Port is connected to servers and is used for the server IO path.
Back End	FC and SAS	Port is connected to disk enclosures.

- **Fault Domain:** Allows you to change the Fault Domain or set to <none>.

  User Alias: Allows you to enter descriptive, user-friendly names for physical ports. The defined name will be displayed as the port name in the System Manager interface.

The following buttons are available and vary by transport type and by operational mode:

- **Edit Fault Domains** (FC and iSCSI tabs): See Editing Fault Domains (FC and iSCSI tabs only) on page 204

- **Edit Virtual Ports** (FC and iSCSI tabs with Virtual Ports licensed): See Edit Virtual Ports (FC and iSCSI only if licensed) on page 206.
- **Reset Defaults** (all tabs): See Resetting Default Port Settings on page 208
- **Cancel** (all tabs): Click to close the wizard.
- **Assign Now** (all tabs): Click to assign the current configuration and close the wizard.

Editing Fault Domains (FC and iSCSI tabs only)

Select the **Edit Fault Domains** button to create, modify, or delete fault domains for the selected transport.

Front end ports are categorized into Fault Domains that identify allowed port movement when a controller or port fails. When working with Fault Domains, you should be aware of the following concepts:

- In dual-controller Legacy Operational Mode:
  - Primary ports are designated for data traffic.
  - Reserved ports assume the data load transfer.
  - In the event of a failed primary port, reserved ports are also used for Inter-Process Communication (IPC) traffic and Replication.
  - Fault domains group primary and reserved front end ports to each another.
  - Primary and reserved ports are assigned the same Fault Domain ID (an arbitrary number) to designate where traffic will be moved in the event of a failover or rebalance.
- In Virtual Port Operational Mode:
  - A Virtual Port's Fault Domain value is changed automatically when the Preferred Physical Port's Fault Domain is changed or when the Virtual Port is moved to a new Preferred Physical Port. This greatly simplifies activities such as merging fault domains.
  - Front-End ports of the same transport type (iSCSI or FC) can be in a single Fault Domain.

Caution For **iSCSI only**, servers initiate IO to iSCSI ports through the Fault Domain's Control Port. If an iSCSI port moves to a different Fault Domain, its Control Port will change. This change will disrupt any service initiated through the previous Control Port. If an iSCSI port moves to a different Fault Domain, you must reconfigure the server-side iSCSI initiators before service can be resumed.

- Although each Virtual Port is assigned a preferred Physical port, in the event of any failure, a Virtual Port can fail over to another Physical port within the Fault Domain.
- With multi-pathing software on a server, volumes can be mapped to ports in more than one Fault Domain. To use multi-pathing, make sure that the server has software, such as MPIO, to manage multi-pathing.
- To reduce network broadcast interference, configure Storage Center Ethernet and iSCSI ports into a separate VLAN.

To edit a fault domain

1 On the Configure Local Ports dialog, click **Edit Fault Domains** to open the **Edit Fault Domains** dialog for the selected transport type.

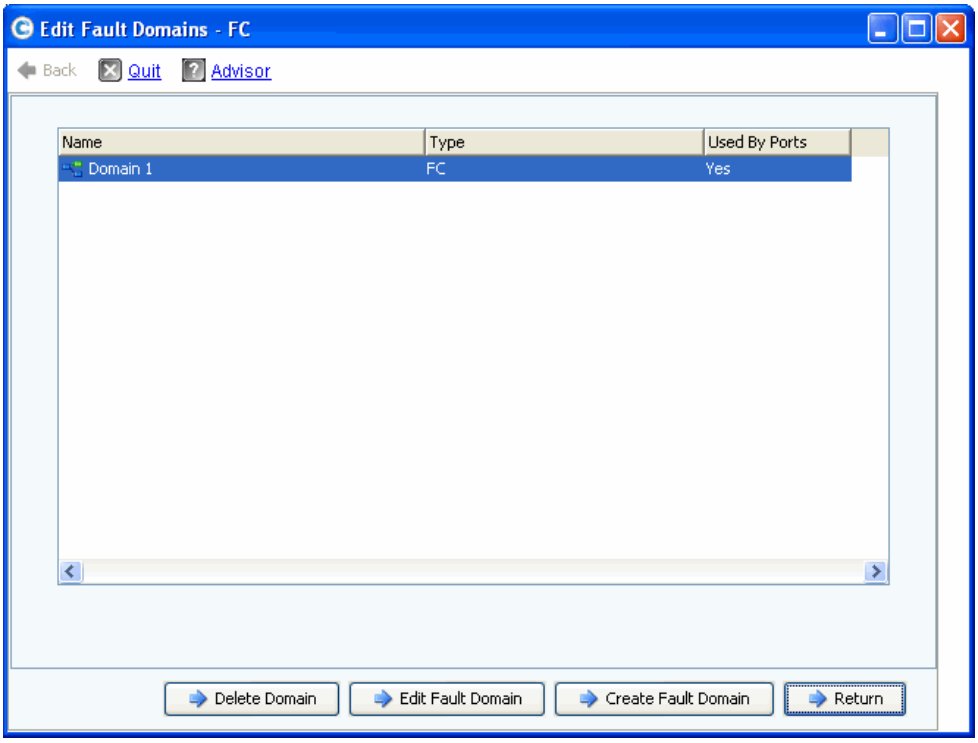


Figure 169. Edit Fault Domains (Fibre Channel example)

From this window, you can:

- **Delete Domain** deletes an existing Fault Domain after you confirm the deletion. Or, returns an error message if the Fault Domain is being used by a local port and cannot be deleted.
- **Edit Fault Domain** opens the Fault Domain Properties window that allows you to enter a new domain name and optional notes for the domain. If the transport type is iSCSI, the Fault Domain Properties window displays an **IP Settings** tab on which you can view and reset:
  - IP Address (for the Control Port of the new iSCSI Fault Domain)
  - Net Mask
  - Gateway
  - Port Number
- **Create Fault Domain** opens the **Create Fault Domain** window shown in Figure 170 on page 206.
- **Return** closes the Edit Fault Domains wizard.

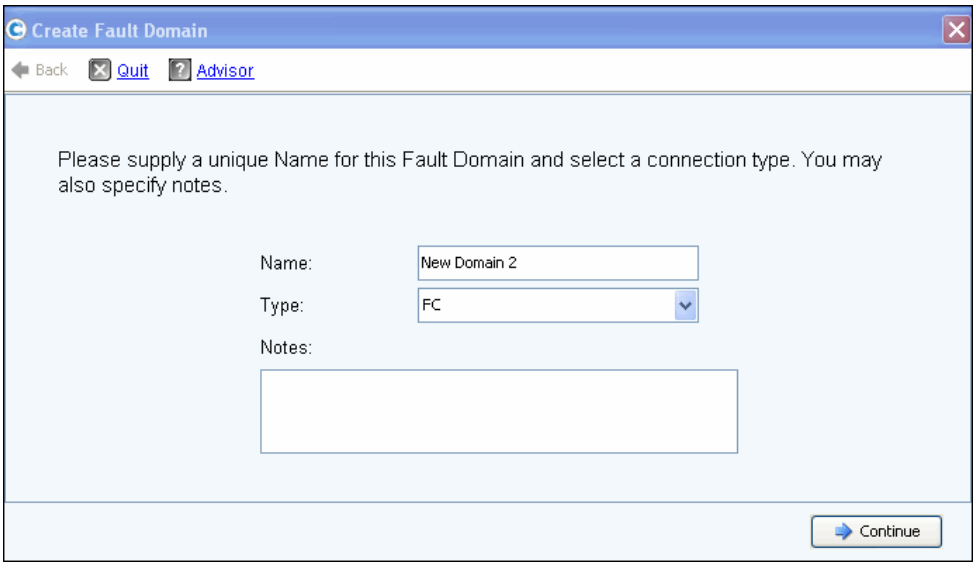


Figure 170. Create Fault Domain

Creating a New Fault Domain

1 Click Create **Fault Domain**. The **Create Fault Domain** window appears.

2 Enter a **Name** and select a transport type from the dropdown **Type** list. Enter any optional notes. Click **Continue**. The **Create Fault Domain** wizard returns a window showing the name and type of the new Fault Domain.

   a **iSCSI only**. If the transport type is iSCSI, **Create Fault Domain** displays an **IP Settings** tab on which you can view and reset:

      - IP Address
      - Net Mask
      - Gateway
      - Port Number

   b Enter any changes and click **Continue**. Create Fault Domain returns a window showing the Name and Type of the new Fault Domain.

3 Click **Create Now** to confirm Fault Domain creation. The **Edit Fault Domains** window reappears listing the new Fault Domain.

4 Click **Return** to return to the **Configure Local Ports** window for the selected transport type.

Edit Virtual Ports (FC and iSCSI only if licensed)

Select the **Edit Virtual Ports** button to modify the preferred physical port value for Virtual Ports.

The **Edit Virtual Ports** button appears on tabs when the operational mode is Virtual Port Mode and the transport type is FC or iSCSI. Use this dialog to modify the Preferred Physical Port of a Virtual Port.

Note When moving a Virtual Port to a different Preferred Physical Port, the Virtual Port's Fault Domain is automatically changed to reflect the Fault Domain of the new Preferred Physical Port.

Editing Virtual Ports

1 Click **Edit Virtual Ports** to open the editing window for the selected transport type.

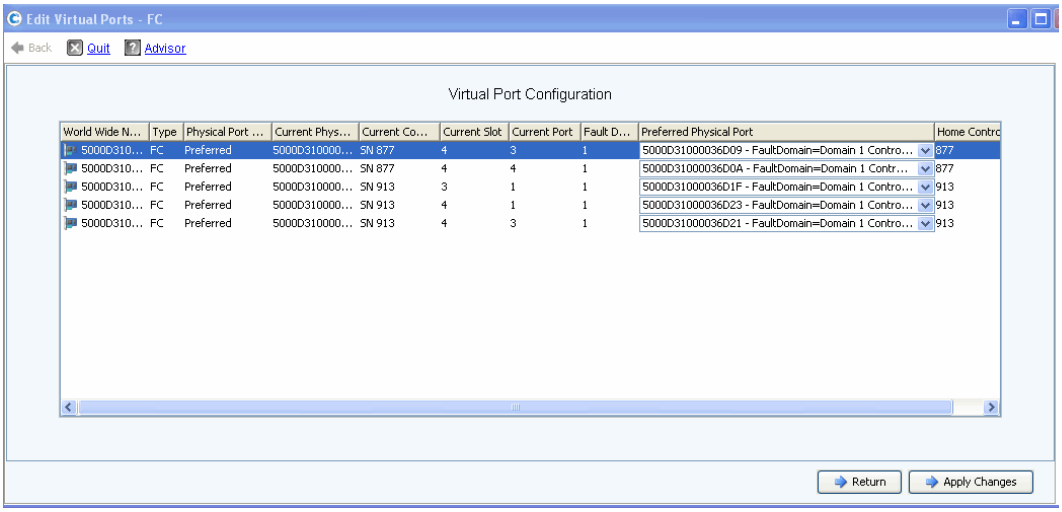


Figure 171. Edit VIrtual Ports

For each card, the system displays:

- **World Wide Name:**
- **Type of Card**
- **Physical Port Association**
- **Current Physical Port**
- **Current Controller**
- **Current Slot**
- **Current Port**
- **Fault Domain**
- **Preferred Physical Port**
- **Home Controller**: Personality Group for a port currently restricted to a single controller. You can only move the Preferred Physical Port to a controller within the same Home Controller (Personality Group).

2 Change the **Preferred Physical Port** using the dropdown menus.

3 Click **Apply Changes** to confirm your edits or **Return** to return to the Configure Local Ports window.

Note If the Physical Port of a Virtual Port does not match its Preferred Physical Port, Storage Center Controllers are **Unbalanced**. From the Storage Management menu, choose **System > Setup > Multi-Controller > Rebalance Local Ports** to open the Rebalance Local Ports wizard and rebalance the ports.

Resetting Default Port Settings

Select the **Reset Defaults** button to generate the default port configuration for the selected transport.

Note Resetting the port configuration to default settings will override any existing port configurations and does not attempt to preserve the current connection state of servers attached to the Storage Center. This process may cause volumes to go off-line.

The **Reset Defaults** button is included on all tabs. Click this button to regenerate the default port settings for the specific transport type.

If no volumes are currently mapped via the transport type, the following window appears:

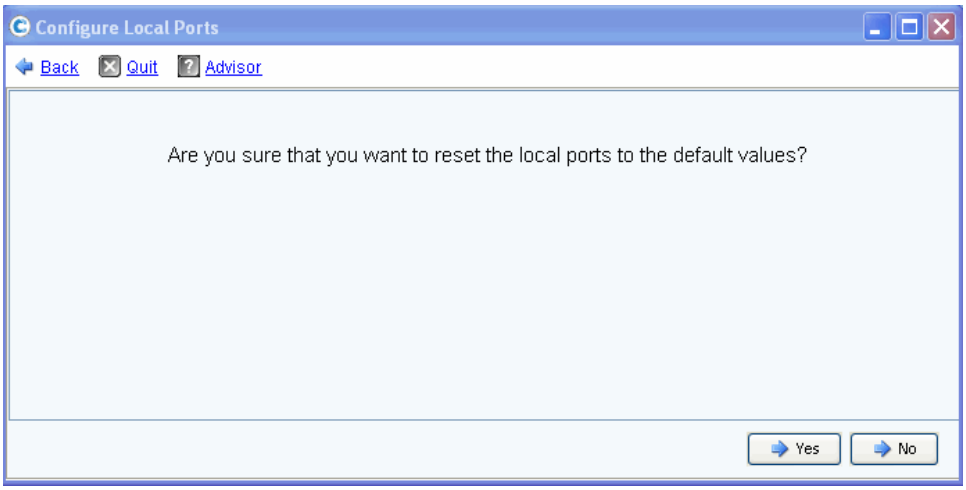


Figure 172. Reset Defaults Confirmation with No Mapping

If volumes are currently mapped via the transport type, the following confirmation window appears:

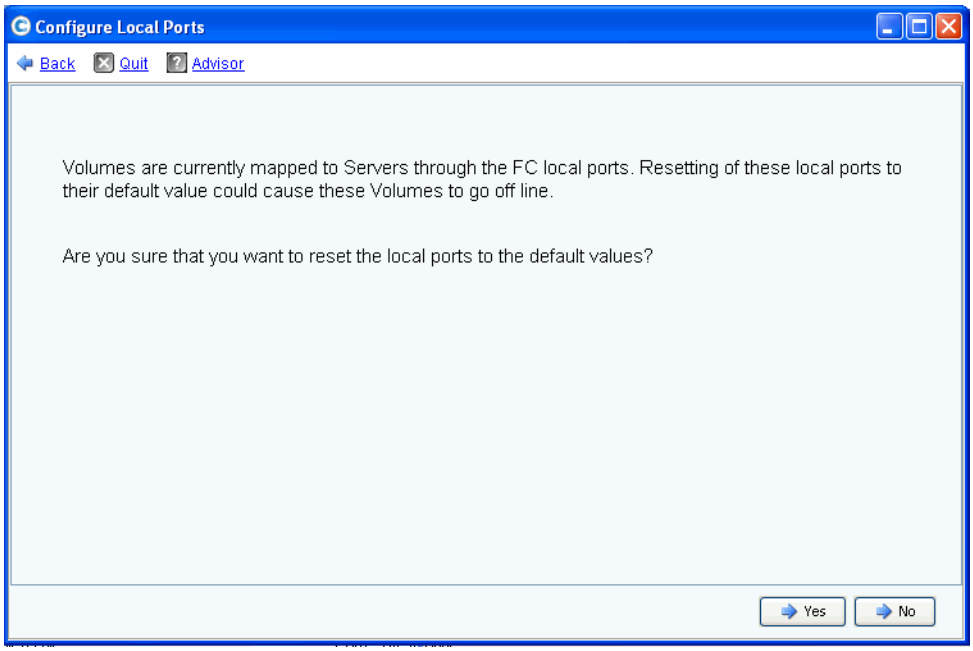

Configure Local Ports
Back
Quit
Advisor
Volumes are currently mapped to Servers through the FC local ports. Resetting of these local ports to their default value could cause these Volumes to go off line.
Are you sure that you want to reset the local ports to the default values?
Yes
No

Figure 173. Reset Defaults Confirmation with Mapping

- Click **Yes** to reset and **No** the reject setting local ports back to their default values.

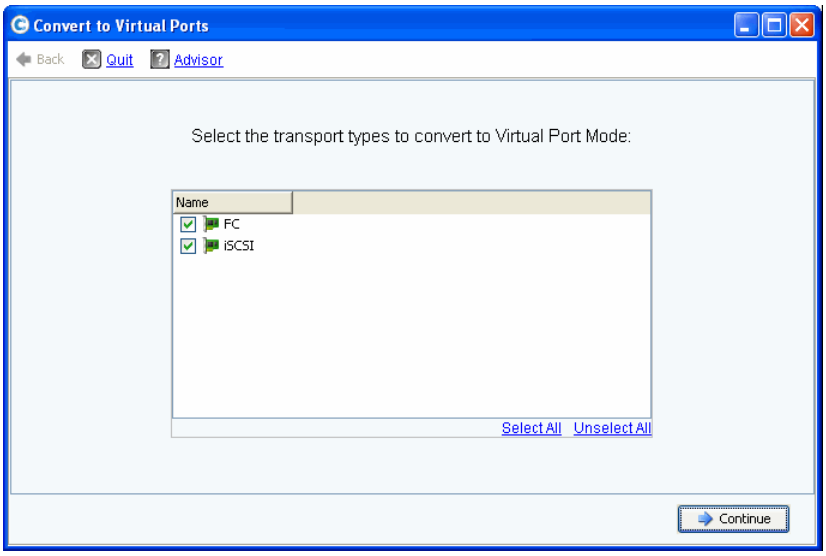
Converting to Virtual Ports

Note Turn on NVIP Mode prior to converting an FC IO card.

Before FC local ports can be converted to Virtual Port Mode, support for N_Port ID Virtualization (NPIV) Mode must be turned on for all front end FC IO Cards. Do this prior to converting to Virtual Port Mode to allow the FC IO cards to communicate with the switches and determine if NPIV is supported.

1 From the Storage Management menu, choose **System > Setup > Convert to Virtual Ports > NPIV Mode On All FC IO Cards > Turn On NVIP Mode.** A window appears asking you to confirm turning on NPIV Mode for front end FC IO cards.

2 From the Storage Management menu, choose **System > Setup > Convert to Virtual Ports**. The **Convert to Virtual Ports** wizard appears.



Note By default, all transport types are selected.

3 Select the transport types (FC or iSCSI) to convert to Virtual Ports. The Storage Center checks to see if the selected transport types are eligible for converting.

- If the conversion pre-check finds errors, an error message explaining the error is returned and the conversion process is canceled.
- If no errors are found, a confirmation message is returned and the conversation process begins.

Configuring iSCSI IO Cards

All iSCSI IO Cards must be assigned static IP Address, Subnet Mask, and Gateway values before the IO Cards can be used. The Configure iSCSI IO Cards wizard simplifies iSCSI IO card configuration by allowing you to configure cards through a single wizard screen. If iSCSI cards were not configured as part of initial setup, use the Configure IO Cards wizard to configure both initialized and initialized cards.

To configure an iSCSI IO card

1 From the Storage Management menu, choose **System > Setup > Configure iSCSI IO Cards**. The **Configure iSCSI IO Cards** window appears.

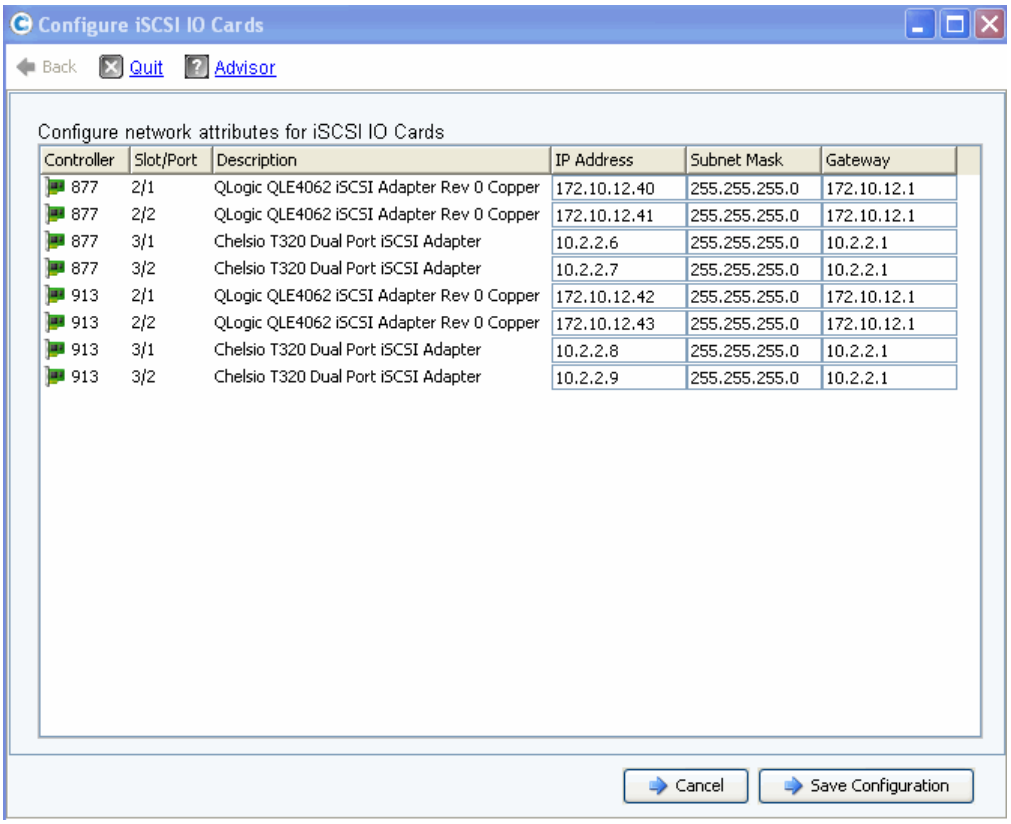

Configure iSCSI IO Cards
Back
Quit
Advisor
Configure network attributes for iSCSI IO Cards
Controller
Slot/Port
Description
IP Address
Subnet Mask
Gateway
877 2/1 QLogic QLE4062 iSCSI Adapter Rev 0 Copper 172.10.12.40 255.255.255.0 172.10.12.1
877 2/2 QLogic QLE4062 iSCSI Adapter Rev 0 Copper 172.10.12.41 255.255.255.0 172.10.12.1
877 3/1 Chelsio T320 Dual Port iSCSI Adapter 10.2.2.6 255.255.255.0 10.2.2.1
877 3/2 Chelsio T320 Dual Port iSCSI Adapter 10.2.2.7 255.255.255.0 10.2.2.1
913 2/1 QLogic QLE4062 iSCSI Adapter Rev 0 Copper 172.10.12.42 255.255.255.0 172.10.12.1
913 2/2 QLogic QLE4062 iSCSI Adapter Rev 0 Copper 172.10.12.43 255.255.255.0 172.10.12.1
913 3/1 Chelsio T320 Dual Port iSCSI Adapter 10.2.2.8 255.255.255.0 10.2.2.1
913 3/2 Chelsio T320 Dual Port iSCSI Adapter 10.2.2.9 255.255.255.0 10.2.2.1
Cancel
Save Configuration

Figure 174. Configure iSCSI IO Cards

Note Uninitialized cards display an IP Address of 0.0.0.0.

2 Enter IP Address, Subnet Mask, and Gateway values for all IO Cards.

3 Click **Save Configuration** to configure the iSCSI IO Card. A progress window appears showing configuring and port refresh progress.

If any IO Cards have not been configured, a warning message is displayed. Select **Yes** to leave the IO cards uninitialized.

4 When configuration is complete, the wizard closes automatically.

Allowing Replications to/from Remote Systems

1 From the Storage Management menu, choose **System > Setup > Allow Replications to/from Remote Systems**. The Allow Replications to/from Remote Systems window appears. This screen shows Storage Center connectivity.

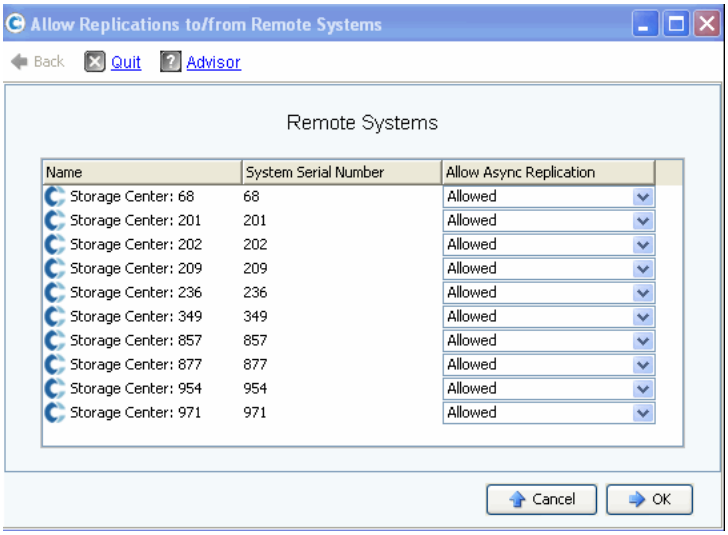


Figure 175. Allow Replications Window

Note By default, asynchronous replication is allowed for all systems.

2 Disallow asynchronous replications by using the dropdown menus on this window to set the value to **Not Allowed**.

For additional information about this topic, refer to Synchronous and Asynchronous Replications on page 329.

Viewing Licensed Applications

From the Help menu, select Licensed Features. The Licensed Features window appears.

Figure 176. Licensed Features

New features can be licensed by clicking on the link.

Configuring System Access via IP Filtering

By default, IP filtering is off, implying an Allow Any rule. Once you create an IP filter, Storage Center infers that no one has access except for the specific access granted in the IP filter. Make sure that the IP filters grant sufficient access to all System Manager users.

Caution: Be careful when configuring IP Filters. If an IP Filter does not permit access to Admin users, it is possible to lock yourself out of the system.

IP Filtering creates access control list either by user type (for example, Administrator) or by specific user. If you use IP Filtering, you must use it to control all system access. IP Filtering creates an Allow Access Control List. If there is no specific allow rule, access is denied.

If you use network address translation (NAT) be sure to specify the IP address that is seen by the Storage Center systems. It will not necessarily be the same as the local IP of the machine you use to access the Storage Center GUI.

Managing IP Filtering

1 From the Storage Management menu, choose **System > Access > IP Filtering > Manage IP Filters**. The first screen of the Manage IP Filters wizard appears:

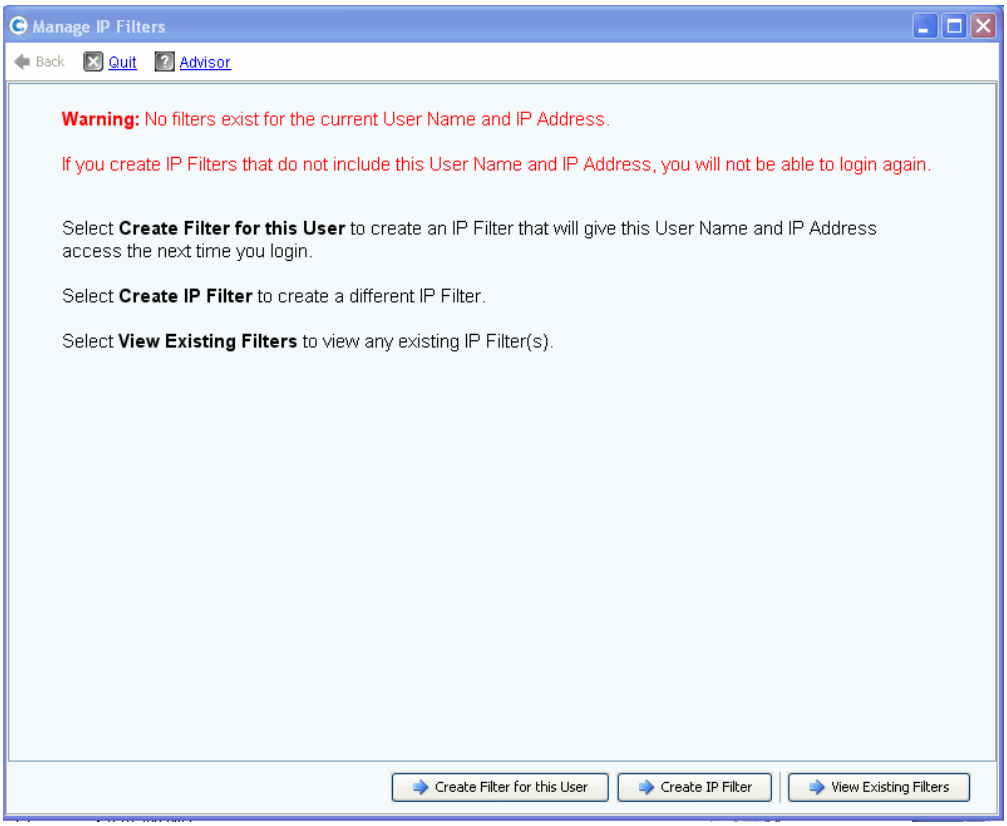

Manage IP Filters
Back
Quit
Advisor
Warning: No filters exist for the current User Name and IP Address.
If you create IP Filters that do not include this User Name and IP Address, you will not be able to login again.
Select Create Filter for this User to create an IP Filter that will give this User Name and IP Address access the next time you login.
Select Create IP Filter to create a different IP Filter.
Select View Existing Filters to view any existing IP Filter(s).
Create Filter for this User
Create IP Filter
View Existing Filters

Figure 177. Manage IP Filters

The System Manager notifies you if there is no filter for the current User Name and IP Address and warns you that you must include this information to have access at the next login. From this window, you can:

- If no filter exists, **Create Filter for this User** allows you create a new filter for the current user that will give the current User Name and IP Address access for subsequent log ons. If a filter already exists for the current user and IP address, this button is not displayed.
- **Create IP Filter** allows you to create a new IP filter.
- **View Existing Filters** allows you to view all existing filters including User Names, User Privileges, and the IP Addresses or Ranges.

Creating an IP Filter for a User

1 Click **Create Filter for this User** on the first screen of the Manage IP Filters wizard. A summary window showing the IP Filter that will be created for the current User Name and IP Address appears.

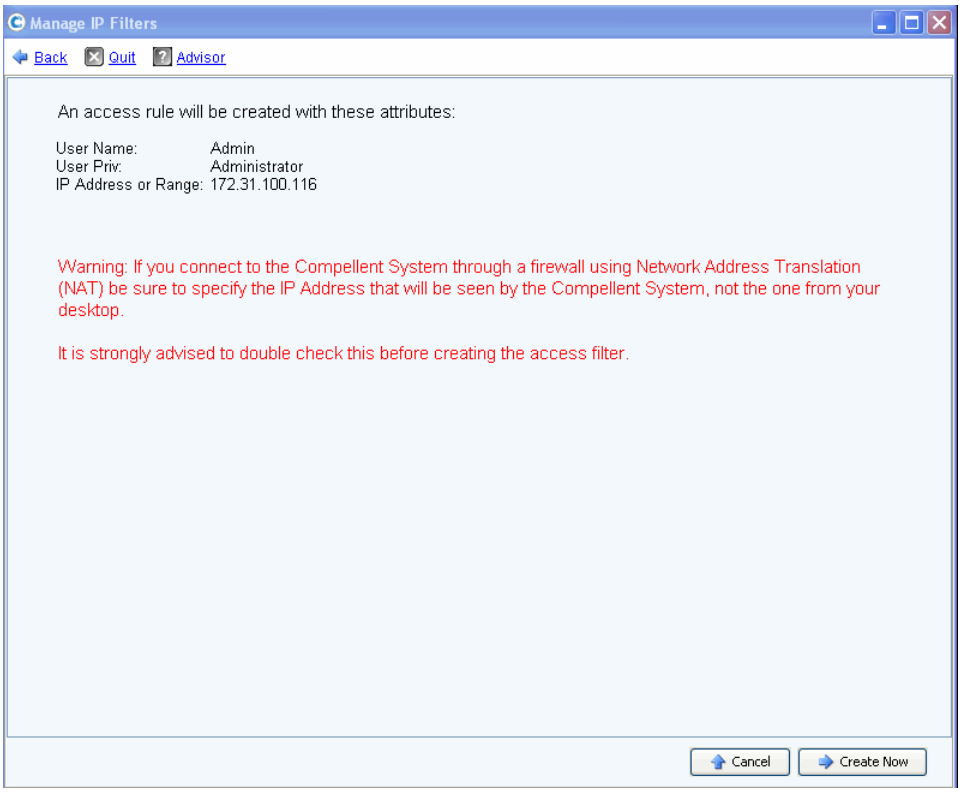

Manage IP Filters
Back
Quit
Advisor
An access rule will be created with these attributes:
User Name: Admin
User Priv: Administrator
IP Address or Range: 172.31.100.116
Warning: If you connect to the Compellent System through a firewall using Network Address Translation (NAT) be sure to specify the IP Address that will be seen by the Compellent System, not the one from your desktop.
It is strongly advised to double check this before creating the access filter.
Cancel
Create Now

Figure 178. Create Filter for this User

If you are using Network Address Translation (NAT), warnings appear cautioning you to use the address that is seen by the Storage Center

2 After you have double checked all information, click **Create Now** to create the access rule filter.

Creating a New IP Filter

1 Click **Create IP Filter** on the first screen of the Manage IP Filters wizard. A window appears that allows you to set a privilege level for a group of users or for a specific user.

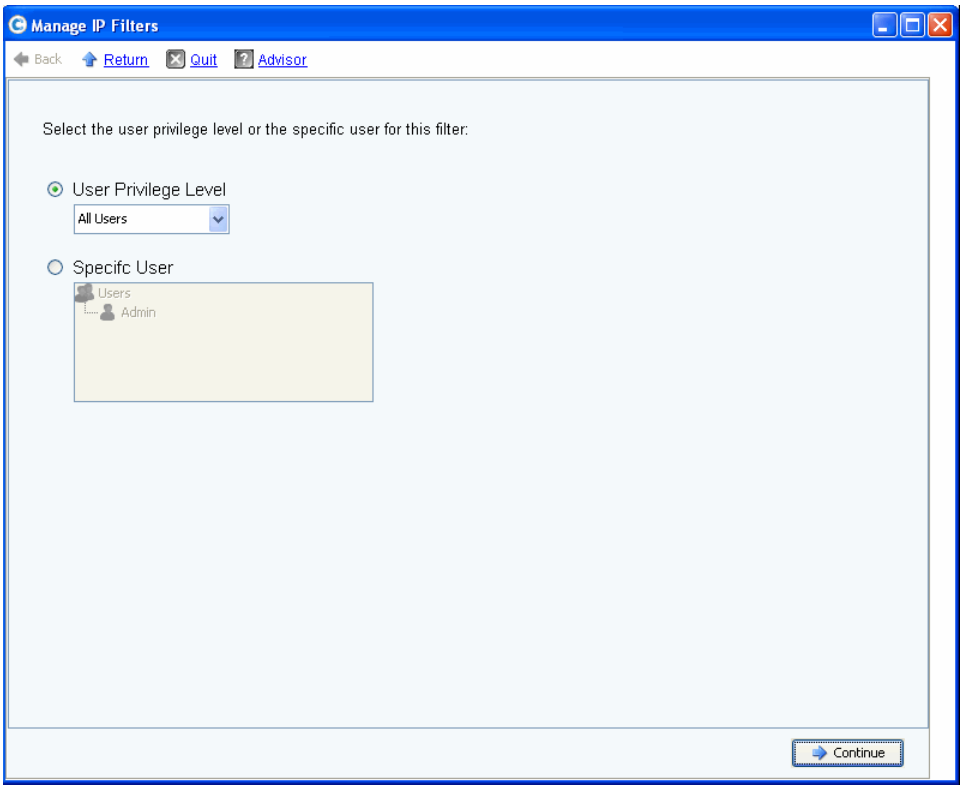


Figure 179. Create IP Filter

2 The window offers the following choices:

- Click **User Privilege Level** to select a privilege level for all users. The choices are: Reporter, Volume Manager, or Administrator.
- Click **Specific User** to select a privilege level for a specific user.

Which ever choice you make, the following window appears that allows you to select a Single Host, an IP Address, or a Range of IP Addresses for the filter.

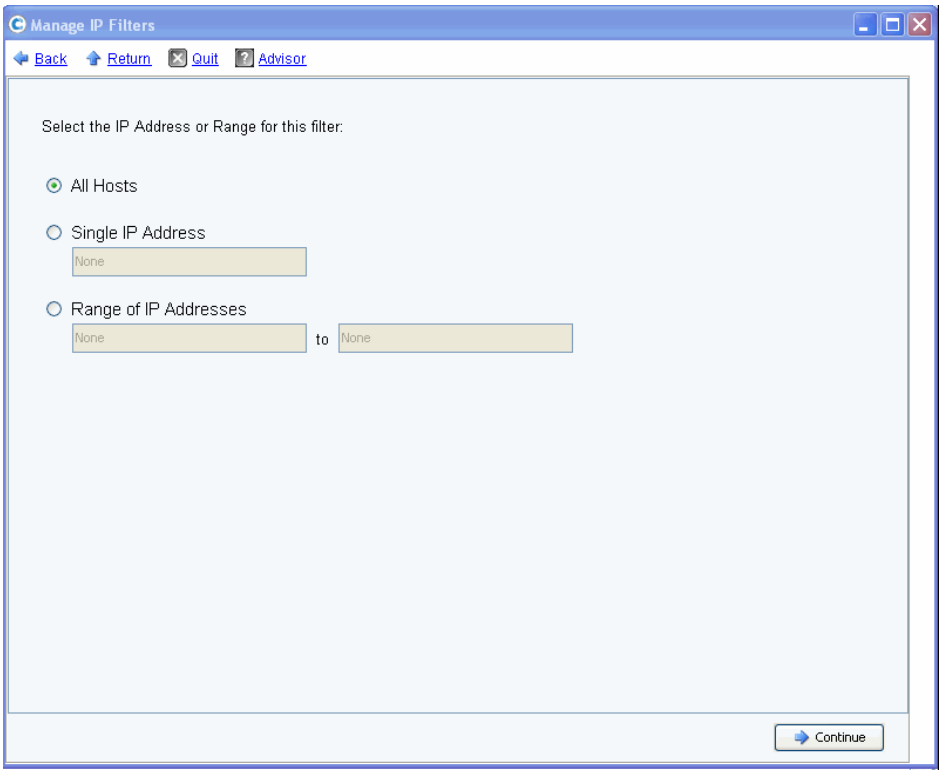


Figure 180. IP Address Selection

The window offers the following choices:

- **All Hosts**
- **Single IP Address**
- **Range of IP Addresses**

3 Make a selection for the IP filter. If single or range is selected, enter the associated IP Address or range of IP Addresses for the filter.

4 Click **Continue**. A summary window appears showing the attributes of the filter you are about to create.

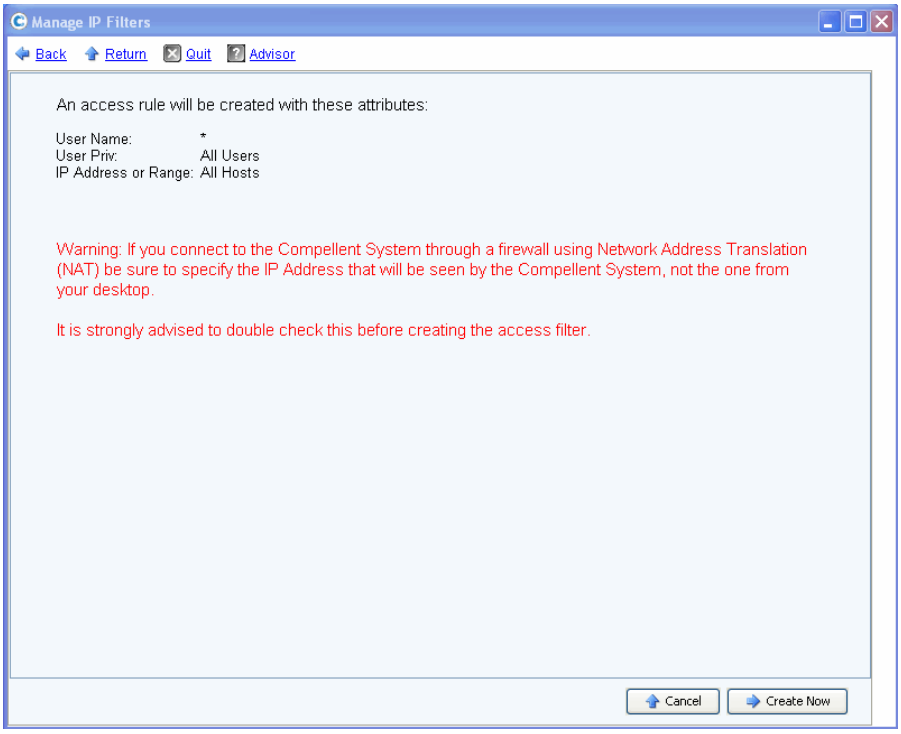

Manage IP Filters
Back
Return
Quit
Advisor
An access rule will be created with these attributes:
User Name: *
User Priv: All Users
IP Address or Range: All Hosts
Warning: If you connect to the Compellent System through a firewall using Network Address Translation (NAT) be sure to specify the IP Address that will be seen by the Compellent System, not the one from your desktop.
It is strongly advised to double check this before creating the access filter.
Cancel
Create Now

Figure 181. Filter Creation Attributes

5 Click **Create Now** to finish creating the filter. A confirmation window appears displaying all Current IP Filter(s) including the newly created filter.

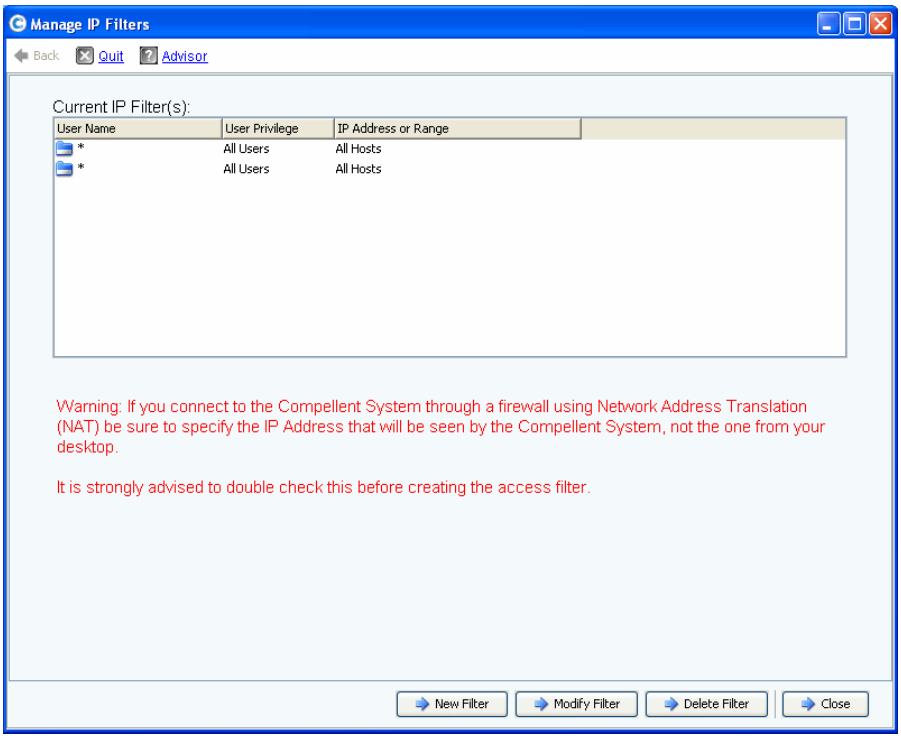

Manage IP Filters
Back
Quit
Advisor
Current IP Filter(s):
User Name
User Privilege
IP Address or Range
* All Users All Hosts
* All Users All Hosts
Warning: If you connect to the Compellent System through a firewall using Network Address Translation (NAT) be sure to specify the IP Address that will be seen by the Compellent System, not the one from your desktop.
It is strongly advised to double check this before creating the access filter.
New Filter
Modify Filter
Delete Filter
Close

Figure 182. Current IP Filters

The window displays the following buttons:

- **New Filter:** This option has the same selections as when creating an IP Filter as shown in Figure 179 on page 216.
- **Modify Filter:** This option has the same selections as shown in Figure 179 on page 216 and when entering an IP Address as shown in Figure 180 on page 217. If a modification would disallow all access for the current User Name and IP Address, a warning message will appear.
- **Delete Filter:** This option deletes the selected IP filter. Do not delete an IP Filter that provides access for the current User ID and IP Address.
- **Close:** Closes the Manage IP Filters wizard. If deletion of the selected filter would disallow all access for the current User Name and IP Address, a warning message will appear.

Viewing Access Violations

From the Storage Management menu, choose **System > Access > IP Filtering > Access Violation Viewer**. The Access Failures window appears. This window reports failures by:

- User Name
- IP Address
- Time

Viewing Disk Space Usage Summary

The **Online Storage** tab displays various storage summaries, trends, and reports.

Available Storage Summary

The Available Storage Summary displays disk space usage for each disk folder.

1 From the Storage Center **View** menu, choose **Online Storage**.

2 Select **Available Storage Summary**. The **Available Storage Summary** window appears.

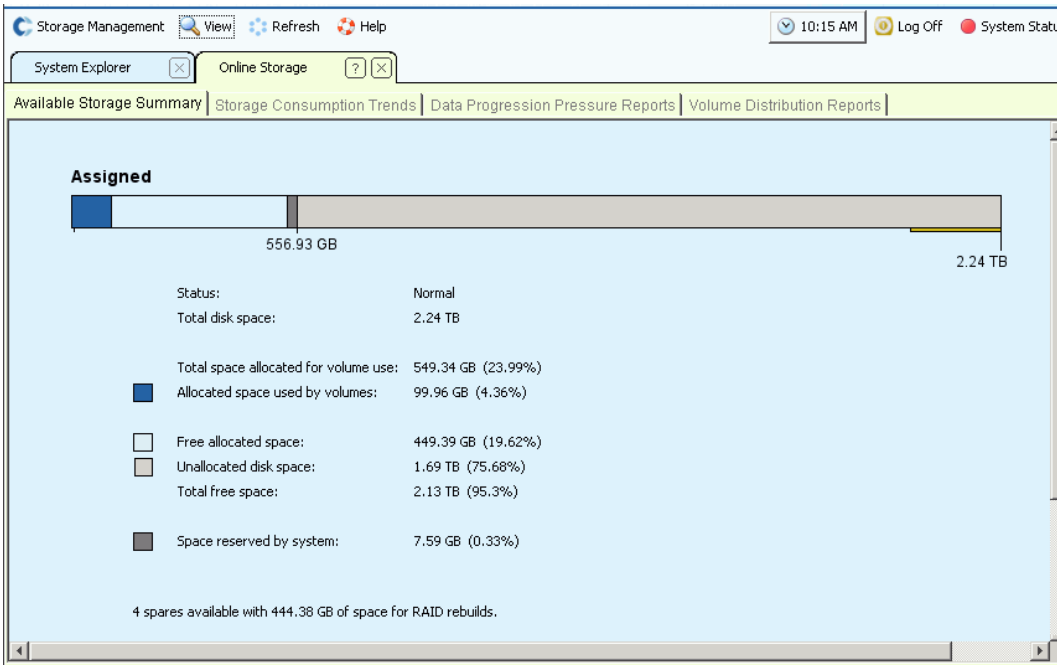


Figure 183. Available Storage Summary Window

The Storage Summary displays:

- **Status**: **Normal** or **Disk Low**. **Disk Low** is an indication that you need to add storage.
- **Total Disk Space:** for each disk folder. Generally there is only one disk folder. Total Disk Space displays the sum of all disk drives in each disk folder. A disk folder is a logical grouping of physical drives with similar page sizes and redundancy. Disk folders can contain a mixture of drive types, capacities, and speeds. The total capacity of the disk folder is the sum of the capacities of the drives within the folder. Disk folders also contain spare drives, reserved to replaced a failed drive. Because space on a spare drive is not used until another drive fails, its capacity is not included in the total capacity for the disk folder.
- **Total Space Allocated for Volume Use**: (total space minus overhead)
- **Allocated Space Used by Volumes**: Storage Center allocates disk space based upon the configurations and IO patterns of each volume. As more space is used, Storage Center allocates additional space. When the system has no more space to allocate, it alerts you via the Alert Monitor.
- **Free Allocated Space**: allocated by the system to be used when needed

- **Unallocated Disk Space**: not allocated, not used
- **Space reserved by system**
- Unusable bad disk sectors on disks, if any
- Number and capacity of spares, if any
- Number of unmanaged disks attached to the system, if any
- Number of external devices attached to the system, if any

Storage Consumption Trends

In addition to the amount of space consumed and available, view IO trends in the Storage Consumption Trends window. This report displays the history of storage consumption for each disk folder and each class of disk.

Data storage trends by disk class indicate which disks are getting increased use. Storage trends by disk class can help you decide which disks to add if a system needs additional space.

To view storage consumption trends

1. From the Storage Center View menu, choose **Online Storage**.
2. Click the **Storage Consumption Trends** tab. The Storage Consumption Trends window appears, showing consumption by disk folder (by default, Assigned) and disk class.

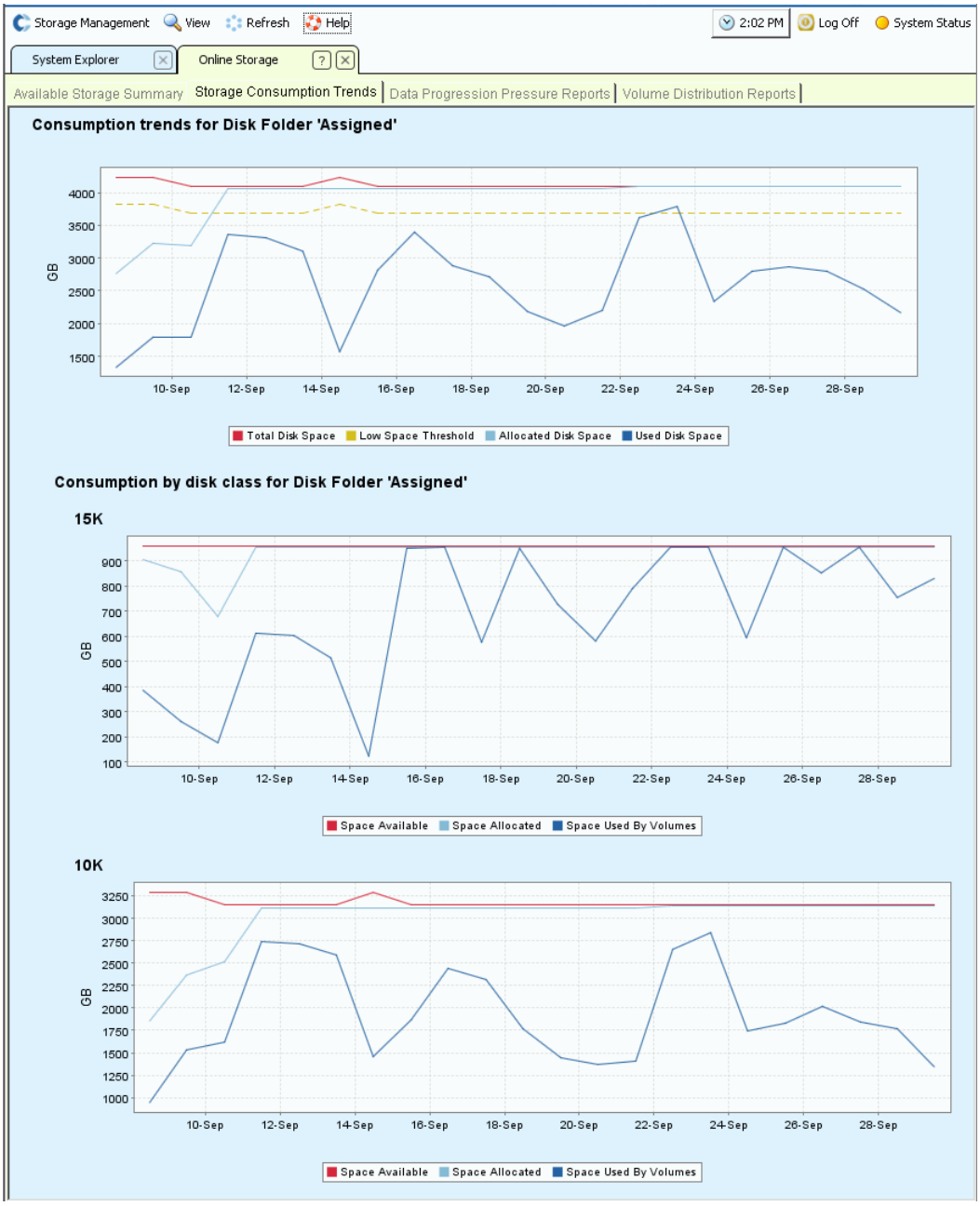


Figure 184. Storage Consumption Trends

Data Progression Pressure Reports

By default, Storage Center using Data Progression gradually migrates data down from high-end drives to be stored on lower-end drives. If a disk class is full, Storage Center writes data to the next lower class. Using Storage Profiles, you can create volumes that reside only on one disk class. For example, a volume that contains only Replays might be stored on a lower disk tier.

Use the Data Progression Pressure Report to make intelligent decisions on the types of disks to add to a system. The System Manager groups disks by disk type. Data Progression uses Dynamic Block Architecture to move data to performance-appropriate and cost-effective disk tiers. For each Storage Type, the Data Progression Pressure Reports window displays how space is allocated and consumed across different RAID types and storage tiers.

To view data progression pressure reports

1 From the **View** menu, select **Online Storage**.

2 Click the **Data Progression Pressure Reports** tab. The **Data Progression Pressure Report** appears.

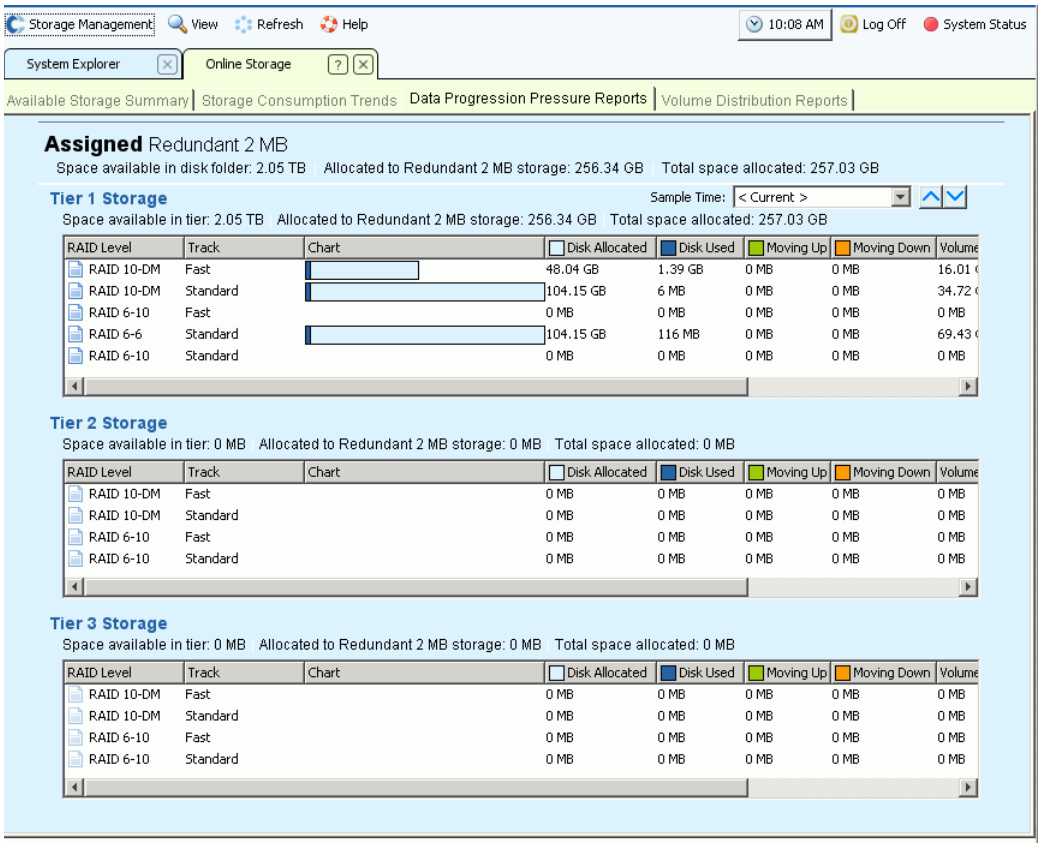

Storage Management
View
Refresh
Help
10:08 AM
Log Off
System Status
System Explorer
Online Storage
Available Storage Summary
Storage Consumption Trends
Data Progression Pressure Reports
Volume Distribution Reports
Assigned Redundant 2 MB
Space available in disk folder: 2.05 TB
Allocated to Redundant 2 MB storage: 256.34 GB
Total space allocated: 257.03 GB
Tier 1 Storage
Sample Time: < Current >
Space available in tier: 2.05 TB
Allocated to Redundant 2 MB storage: 256.34 GB
Total space allocated: 257.03 GB
RAID Level
Track
Chart
Disk Allocated
Disk Used
Moving Up
Moving Down
Volume
RAID 10-DM Fast 48.04 GB 1.39 GB 0 MB 0 MB 16.01
RAID 10-DM Standard 104.15 GB 6 MB 0 MB 0 MB 34.72
RAID 6-10 Fast 0 MB 0 MB 0 MB 0 MB 0 MB
RAID 6-6 Standard 104.15 GB 116 MB 0 MB 0 MB 69.43
RAID 6-10 Standard 0 MB 0 MB 0 MB 0 MB 0 MB
Tier 2 Storage
Space available in tier: 0 MB
Allocated to Redundant 2 MB storage: 0 MB
Total space allocated: 0 MB
RAID 10-DM Fast 0 MB 0 MB 0 MB 0 MB 0 MB
RAID 10-DM Standard 0 MB 0 MB 0 MB 0 MB 0 MB
RAID 6-10 Fast 0 MB 0 MB 0 MB 0 MB 0 MB
RAID 6-10 Standard 0 MB 0 MB 0 MB 0 MB 0 MB
Tier 3 Storage
Space available in tier: 0 MB
Allocated to Redundant 2 MB storage: 0 MB
Total space allocated: 0 MB
RAID 10-DM Fast 0 MB 0 MB 0 MB 0 MB 0 MB
RAID 10-DM Standard 0 MB 0 MB 0 MB 0 MB 0 MB
RAID 6-10 Fast 0 MB 0 MB 0 MB 0 MB 0 MB
RAID 6-10 Standard 0 MB 0 MB 0 MB 0 MB 0 MB

Figure 185. Data Progression Pressure Reports

The **Data Progression Pressure Report** displays:

- Space available in a disk folder, such as Assigned. Disk folders cannot share space.
- Space allocated to this type of storage.
- Total space allocated across all types of storage

For each tier, the Data Progression Pressure Report displays

- Space available in tier.
- Space allocated to this type of storage

- Total space allocated from this tier across all types of storage

Click on a column head to sort data in that column. Within each Tier, the **Data Progression Pressure Report** displays

- **RAID** level
- **Track**: fast or standard
- Bar chart displaying allocated space and space consumed
- **Disk Allocated**: Space reserved for volumes on this system
- **Disk Used**: From the amount allocated, the amount that is in use by volumes
- **Moving Up**: In the next Data Progression cycle, the amount that will be moved up. Indicated in the bar chart by a green bar and up arrow.
- **Moving Down**: In the next data progression cycle, the amount that will be moved down. Indicated in the bar chart by an orange bar and a down arrow.
- **Volume Allocated**: The amount of space presented for the use by volumes after RAID is applied
- **Volume Used**: The amount of space used by volumes after RAID is applied.
- The amount of space saved by moving less-accessed data to RAID 5 rather than using RAID 10 for all data

Data Progression Pressure Reports can display data up to 30 previous days so that you can see how Data Progression has moved data between RAID types and disk tiers. To view status for a previous time period, click the pull down menu. Select a date and time.

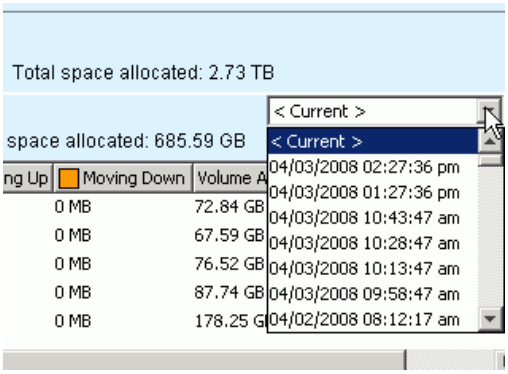


Figure 186. Select Previous Time for Data Progression Pressure Report

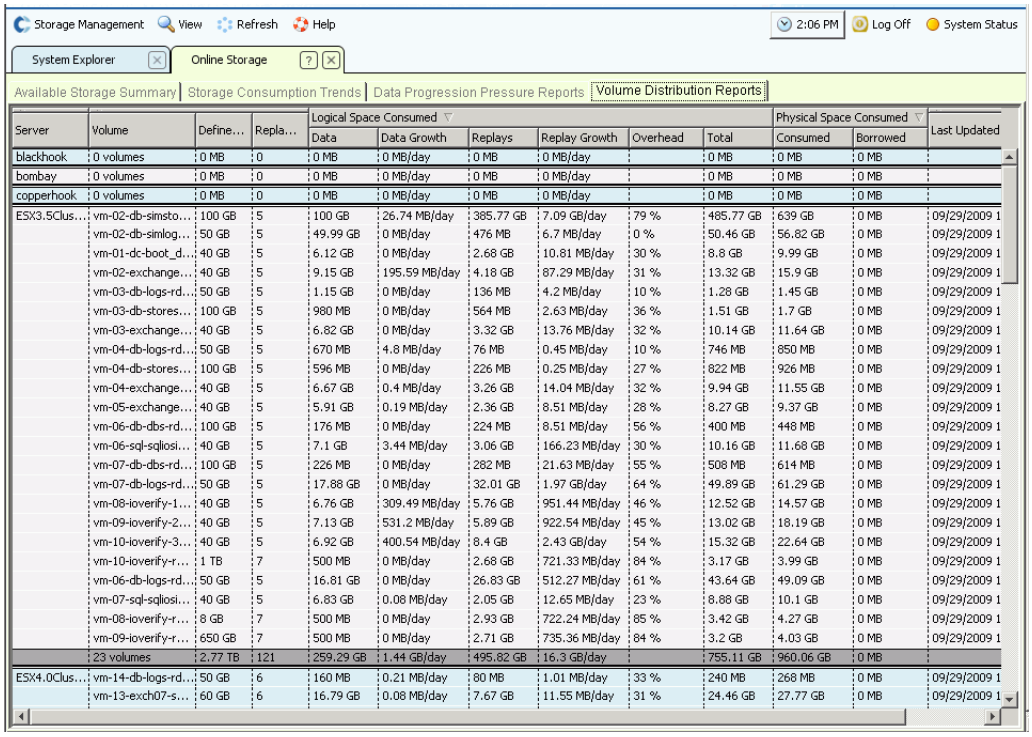
Volume Distribution Reports

The **Volume Distribution Reports** window displays the amount of storage space each volume is consuming. Information includes space allocated for a volume and the amount of space actually consumed. The volume distribution report can help you recover space by identifying logical and physical space.

To view the volume distribution report

1 From the **View** menu, select **Online Storage**.

2 Click the **Volume Distribution Report** tab. The **Volume Distribution Report** appears.



Server	Volume	Define...	Repla...	Logical Space Consumed						Physical Space Consumed		Last Updated
				Data	Data Growth	Replays	Replay Growth	Overhead	Total	Consumed	Borrowed	
blackhook	0 volumes	0 MB	0	0 MB	0 MB/day	0 MB	0 MB/day		0 MB	0 MB	0 MB	
bombay	0 volumes	0 MB	0	0 MB	0 MB/day	0 MB	0 MB/day		0 MB	0 MB	0 MB	
copperhook	0 volumes	0 MB	0	0 MB	0 MB/day	0 MB	0 MB/day		0 MB	0 MB	0 MB	
ESX3.5Clus...	vm-02-db-simsto...	100 GB	5	100 GB	26.74 MB/day	385.77 GB	7.09 GB/day	79 %	485.77 GB	639 GB	0 MB	09/29/2009 1
	vm-02-db-simlog...	50 GB	5	49.99 GB	0 MB/day	476 MB	6.7 MB/day	0 %	50.46 GB	56.82 GB	0 MB	09/29/2009 1
	vm-01-dc-boot_d...	40 GB	5	6.12 GB	0 MB/day	2.68 GB	10.81 MB/day	30 %	8.8 GB	9.99 GB	0 MB	09/29/2009 1
	vm-02-exchange...	40 GB	5	9.15 GB	195.59 MB/day	4.18 GB	87.29 MB/day	31 %	13.32 GB	15.9 GB	0 MB	09/29/2009 1
	vm-03-db-logs-rd...	50 GB	5	1.15 GB	0 MB/day	136 MB	4.2 MB/day	10 %	1.28 GB	1.45 GB	0 MB	09/29/2009 1
	vm-03-db-stores...	100 GB	5	980 MB	0 MB/day	564 MB	2.63 MB/day	36 %	1.51 GB	1.7 GB	0 MB	09/29/2009 1
	vm-03-exchange...	40 GB	5	6.82 GB	0 MB/day	3.32 GB	13.76 MB/day	32 %	10.14 GB	11.64 GB	0 MB	09/29/2009 1
	vm-04-db-logs-rd...	50 GB	5	670 MB	4.8 MB/day	76 MB	0.45 MB/day	10 %	746 MB	850 MB	0 MB	09/29/2009 1
	vm-04-db-stores...	100 GB	5	596 MB	0 MB/day	226 MB	0.25 MB/day	27 %	822 MB	926 MB	0 MB	09/29/2009 1
	vm-04-exchange...	40 GB	5	6.67 GB	0.4 MB/day	3.26 GB	14.04 MB/day	32 %	9.94 GB	11.55 GB	0 MB	09/29/2009 1
	vm-05-exchange...	40 GB	5	5.91 GB	0.19 MB/day	2.36 GB	8.51 MB/day	28 %	8.27 GB	9.37 GB	0 MB	09/29/2009 1
	vm-06-db-dbs-rd...	100 GB	5	176 MB	0 MB/day	224 MB	8.51 MB/day	56 %	400 MB	448 MB	0 MB	09/29/2009 1
	vm-06-sql-sqliosi...	40 GB	5	7.1 GB	3.44 MB/day	3.06 GB	166.23 MB/day	30 %	10.16 GB	11.68 GB	0 MB	09/29/2009 1
	vm-07-db-dbs-rd...	100 GB	5	226 MB	0 MB/day	282 MB	21.63 MB/day	55 %	508 MB	614 MB	0 MB	09/29/2009 1
	vm-07-db-logs-rd...	50 GB	5	17.88 GB	0 MB/day	32.01 GB	1.97 GB/day	64 %	49.89 GB	61.29 GB	0 MB	09/29/2009 1
	vm-08-ioverify-1...	40 GB	5	6.76 GB	309.49 MB/day	5.76 GB	951.44 MB/day	46 %	12.52 GB	14.57 GB	0 MB	09/29/2009 1
	vm-09-ioverify-2...	40 GB	5	7.13 GB	531.2 MB/day	5.89 GB	922.54 MB/day	45 %	13.02 GB	18.19 GB	0 MB	09/29/2009 1
	vm-10-ioverify-3...	40 GB	5	6.92 GB	400.54 MB/day	8.4 GB	2.43 GB/day	54 %	15.32 GB	22.64 GB	0 MB	09/29/2009 1
	vm-10-ioverify-r...	1 TB	7	500 MB	0 MB/day	2.68 GB	721.33 MB/day	84 %	3.17 GB	3.99 GB	0 MB	09/29/2009 1
	vm-06-db-logs-rd...	50 GB	5	16.81 GB	0 MB/day	26.83 GB	512.27 MB/day	61 %	43.64 GB	49.09 GB	0 MB	09/29/2009 1
	vm-07-sql-sqliosi...	40 GB	5	6.83 GB	0.08 MB/day	2.05 GB	12.65 MB/day	23 %	8.88 GB	10.1 GB	0 MB	09/29/2009 1
	vm-08-ioverify-r...	8 GB	7	500 MB	0 MB/day	2.93 GB	722.24 MB/day	85 %	3.42 GB	4.27 GB	0 MB	09/29/2009 1
	vm-09-ioverify-r...	650 GB	7	500 MB	0 MB/day	2.71 GB	735.36 MB/day	84 %	3.2 GB	4.03 GB	0 MB	09/29/2009 1
	23 volumes	2.77 TB	121	259.29 GB	1.44 GB/day	495.82 GB	16.3 GB/day		755.11 GB	960.06 GB	0 MB	
ESX4.0Clus...	vm-14-db-logs-rd...	50 GB	6	160 MB	0.21 MB/day	80 MB	1.01 MB/day	33 %	240 MB	268 MB	0 MB	09/29/2009 1
	vm-13-exch07-s...	60 GB	6	16.79 GB	0.08 MB/day	7.67 GB	11.55 MB/day	31 %	24.46 GB	27.77 GB	0 MB	09/29/2009 1

Figure 187. Volume Distribution Report

- **Server**: Storage Center groups volumes by the server to which they are mapped. The row beneath each server grouping details the totals for all volumes mapped to that server.
- **Volume**: Name of the volume
- **Defined Size**: Defined logical size of the volume.
- **Replay Count**: number of Replays associated with the volume. The Replay count includes the active Replay. Each volume has a Replay count of at least one, even if no manual or scheduled Replays have been taken. Volumes are attached to Replay Profiles. You may be able to recover some space by revising a Replay Profile.

Logical Space Consumed

Under the heading, **Logical Space Consumed**, the **Volume Distribution Report** displays:

- **Data**
- **Data Growth**
- **Replays**
- **Replay Growth**
- **Overhead**
- **Total Logical Space Consumed**

The **Volume Distribution Report** displays logical space consumed by a volume and additional space this volume is consuming because of the existence of Replays. It details growth rate trends for both the volume and the associated Replays. Because Replays contain information about changes that occurred on a volume over time, they take up space. For example, a volume and all of its Replays might consume 10 GB of space. If all the Replays were expired, the volume would only consume 8 GB of space. In this case, the Replay overhead is 2 GB.

Physical Space Consumed

Under the heading, **Physical Space Consumed**, the **Volume Distribution Report** displays physical space:

- Consumed
- Borrowed
- When the displays was last updated

Physical Space Consumed details the physical disk space consumed by a volume and all associated Replays. If this volume is a View volume related to another volume, it could be borrowing space from that volume. Borrowed space occurs when a volume shares Replay space with another volume.

SNMP Server

The Simple Network Management Protocol (SNMP) properties monitors Storage Center over the network using the SNMP application.

Configuring the SNMP Server

1. From the Storage Management menu, choose **System > Access > Configure SNMP Server.** The SNMP window appears.
2. Enter **Read-only Community String**.
3. Enter **Read Write Community String**.
4. Click **Start Agent**.
5. Enter **Trap Community String**.
6. Enter **Trap Port**.
7. Select a **Trap Type**.
8. Click **Start Trap**.
9. Click **OK**.

Configuring a Secure Console

Caution: A machine used as a proxy server for Phone Home cannot be dependent upon Storage Center itself. If a proxy server is dependent on Storage Center, the system cannot Phone Home or connect via SSH as it is booting. Do not modify secure console configuration without the assistance of Dell Support Services.

A secure console allows support personnel to access to a Storage Center console via SSH without connecting through the serial port.

To configure a secure console

1. From the Storage Management menu, choose **System > Access > Configure Secure Console**. The system warns you not to modify the secure console without the assistance of Dell Support Services.
2. If you are being assisted by Dell Support Services, click **Continue**. The Configure Secure Console window appears.
3. For additional information, contact Dell Support Services.

Restarting / Disabling Secure Console Access

If secure console access was enabled via the Configure Secure Console wizard, options to restart or disable secure console access to the Storage Center are available on the **Storage Management > System > Access** menu.

Generating a New SSL Certificate

To generate an SSL certificate

1 Choose **System > Access > Generate New SSL Certificate**. The **Generate New SSL Certificate** window appears.

Note The initial certificates shipped with the Storage Center probably will not match the IP Address or DNS name assigned to your system once it is set up on your network. This means that when you connect to the Storage Center, you see a pop up message identifying a mismatch when comparing the IP Address or DNS name in the certificate, to the IP Address or DNS of the system.

2 To correct this mismatch, enter the **IP Address** or **DNS name** of Storage Center as you refer to it in your browser. Storage Center generates a new certificate set with this **IP Address** or **DNS name**, eliminating the mismatch message when connecting. This command closes the current connection. You must login again to the system after the new certificate is generated.

3 Click **Generate Now** to create and install the new certificates.

Resetting the License Acceptance

1 From the Storage Management menu, choose **System > Access > Reset License Acceptance**.

2 Click **Yes (Reset Now)**.

Viewing System Properties

From the Storage Management menu, choose **System > Properties**. The General **System Properties** window appears.

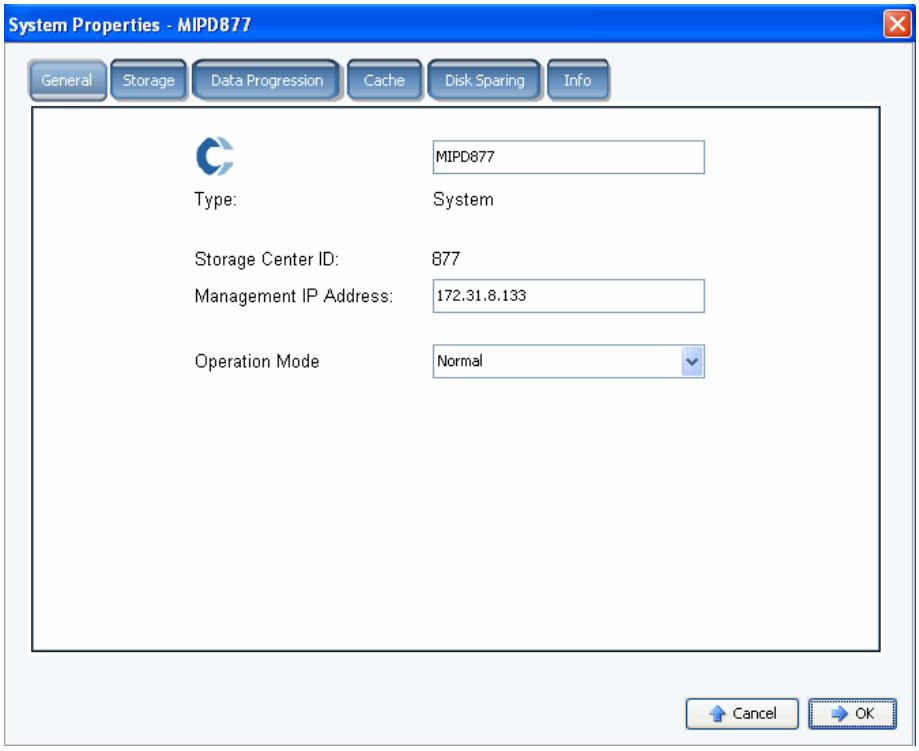


Figure 188. System Properties – General

From this window you can change the following settings:

- **System name**: Changing the system name does not have any real effect on the system other than displaying a different name.
- **Management IP Address**: is used only for dual controller systems. It is the IP address that is used for running the system software. This IP Address is always connected to the leader. If the leader fails, the peer takes over the management IP. Thus users can use the same IP address to access the software even when the normal leader is down.
- **Operation Mode**: The default mode is **Normal**. Changing to **Maintenance** or **Install** ignore the alerts that are created in certain circumstances. When a system is first set up, it has a value of **Install**. At the end of the startup wizard the value is changed back to **Normal**.

3 Click **OK** to save any changes.

Selecting RAID Stripe Width

The default stripe width for storage profiles is 10 wide (RAID 6-10). Modifying this value updates the RAID 6 selections for all system Storage Profiles. It also modifies the RAID 6 selections for user-created Storage Profiles unless Manual Storage Mode is enabled.

In a standard Storage Center system, a percentage of most-used data is storage on RAID 10 (striped and mirrored). Data that is used less is stored on RAID 6-10 (which uses an algorithm to rebuild data if one drive in the logical unit should fail). For RAID 5, the stripe width determines whether the logical unit is comprised of five or nine drives. For RAID 6, the stripe width determines whether the logical unit is comprised of six or ten drives. Distributing data across more drives is marginally more efficient, but increases vulnerability. Distributing data across fewer drives is less efficient, but marginally decreases vulnerability.

To select RAID stripe width

1 From the Storage Management menu, select **System > Properties.**

2 Click the **Storage** tab. The system **Storage Properties** window appears.

- For RAID 5, choose between RAID 5-5, which distributes parity across five drives, or RAID 5-9, which distributes parity across nine drives.
- For RAID 6, choose between RAID 6-6, which distributes parity across six drives, or RAID 6-10, which distributes parity across 10 drives.

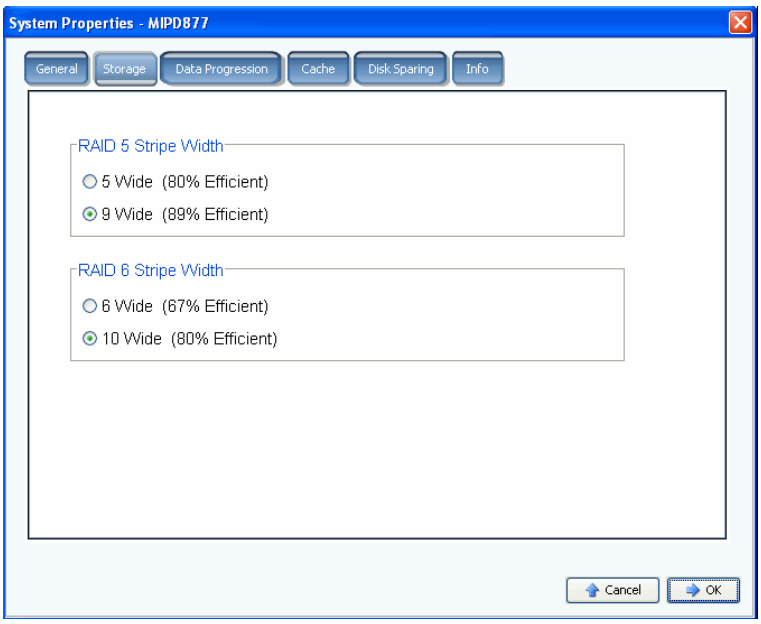


Figure 189. System Properties – Storage

Caution: Do not change the system-wide RAID level if the system is in **Conservation Mode**. Although it would seem logical that changing the RAID level from fewer drives to more drives would free space, the system needs additional space to park data

before restriping it. If you try to change the system-wide RAID level from five or six drives to nine or ten drives, you will run out of free space that must sooner. If Storage Center is in **Emergency Mode**, you cannot change RAID level.

Data Progression

Data Progression is a separately licensed application. To see if your Storage Center includes Data Progression, click the **Help** icon at the top of the main window.

Data Progression leverages cost and performance differences between storage tiers, allowing the maximum use of lower-cost drives for stored data, while maintaining high-performance drives for frequently-accessed data. Storage Center automatically creates tiers based on the disks in your system. Tier 1 is fastest, Tier 3 the slowest. To view classes of tiers on your system, select a disk folder. A list of disk types by tier appears.

Once every 24 hours, Storage Center polls blocks to see if they have been accessed. Blocks of data are then migrated up or down depending on use. The amount of time the migration takes depends on the amount of data to be migrated.

Scheduling Data Progression

1 From the Storage Management menu, select **System > Properties**.

2 Click the **Data Progression** tab. The **Data Progression Properties** window appears.

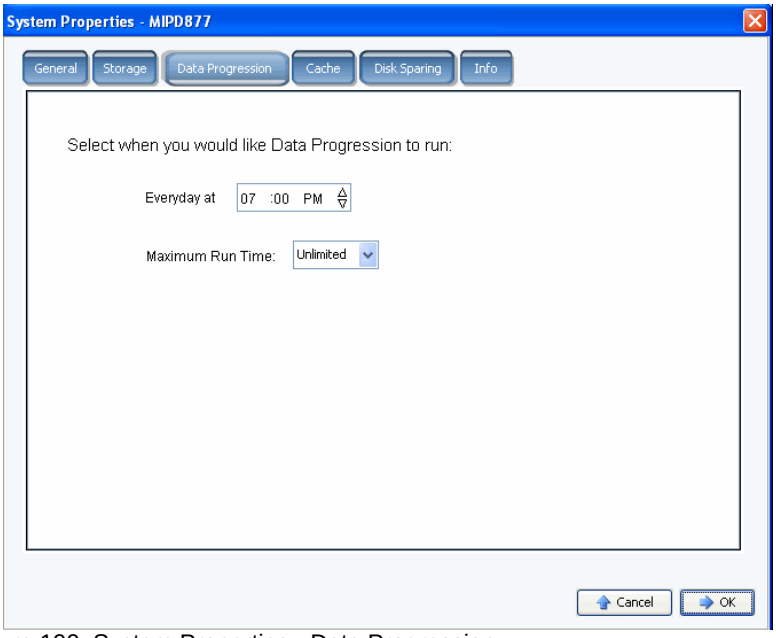


Figure 190. System Properties - Data Progression

3 Click in the **Hour**, **Minute**, and **AM/PM** field. Use the up and down arrows to change the hour, minute or time of day.

4 To limit the amount of time Data Progression runs, select a **Maximum Run Time**, from one hour to unlimited time.

5 Click **OK**.

Determining if Data Progression is Running

1 In the system tree, select a volume. A window showing general properties is displayed.

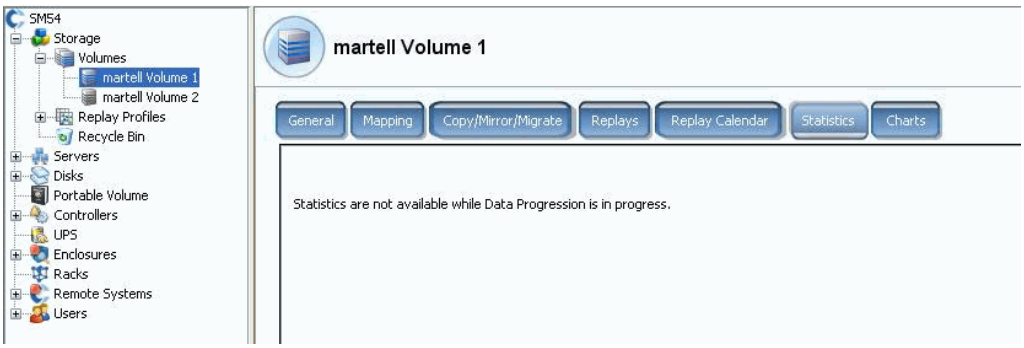


Figure 191. Statistics with Data Progression

2 Click the **Statistics t**ab. If Data Progression is running, the system informs you that statistics are not available while Data Progression is in progress.

Stopping Data Progression

1 From the Storage Management menu, select **Volume**. If the Volume menu displays the **Stop Data Progression** option, Data Progression is running.

2 Select **Stop Data Progression**. Data Progression is stopped.

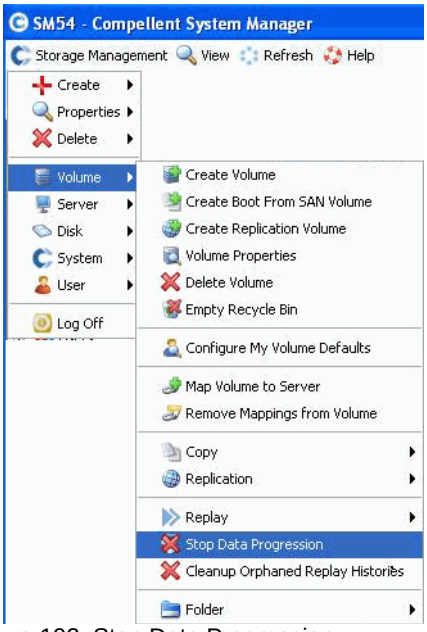


Figure 192. Stop Data Progression

Setting System Cache

Global cache settings overwrite cache settings for individual volumes.

1 From the Storage Management menu, choose **System > Properties**. The **System Properties** window appears. Select the **Cache** tab.

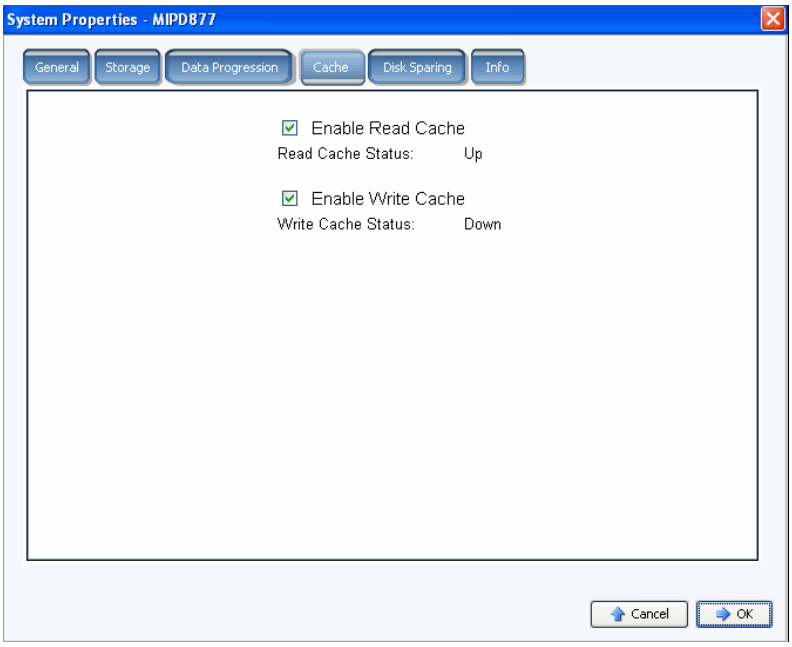


Figure 193. System Properties – Cache

2 Select or clear system-wide **Read Cache**. Read Cache anticipates the next Read seek and holds it in quick volatile memory, thus improving Read performance.

3 Select or clear system-wide **Write Cache**. Write Cache holds written data in volatile memory until it can be safely stored on disk. Write Cache protects in the event of a power loss.

4 Click **OK** to save changes.

Configuring Global Disk Spares

1 From the Storage Management menu, choose **System > Properties**.

2 Click the **Disk Sparing** tab.

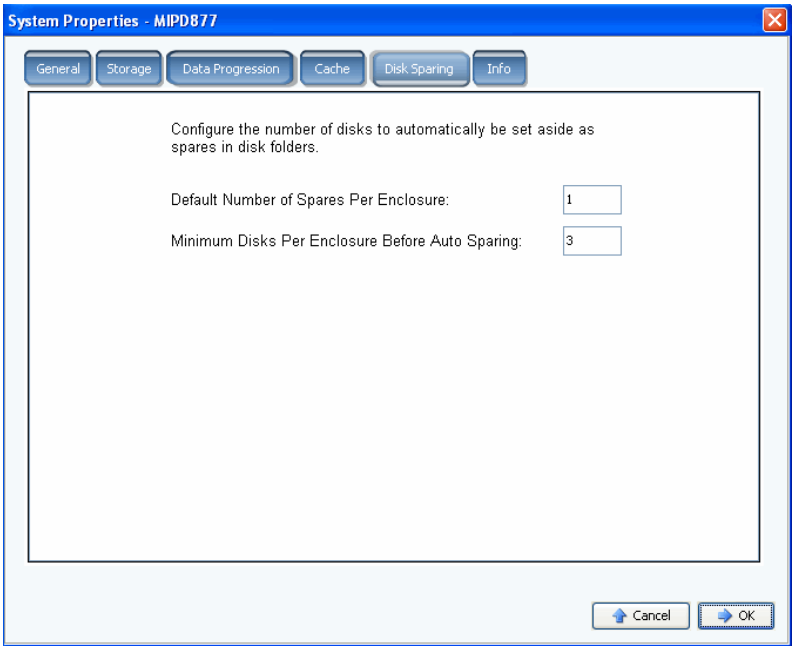


Figure 194. System Properties – Disk Sparing

3 Enter the default number of spares per storage enclosure. This is the minimum number of disks to be selected in an enclosure when creating a disk folder before a hot spare is selected.

4 Enter the minimum disks per enclosure before auto-sparing. This is the number of disks that have to be selected in a Storage Center Storage Enclosure before a hot spare is selected.

5 Click **OK** to save changes.

Adding Optional Information about Storage Center

1 From the Storage Management menu, choose **System > Properties**.

2 Click the **Info** tab.

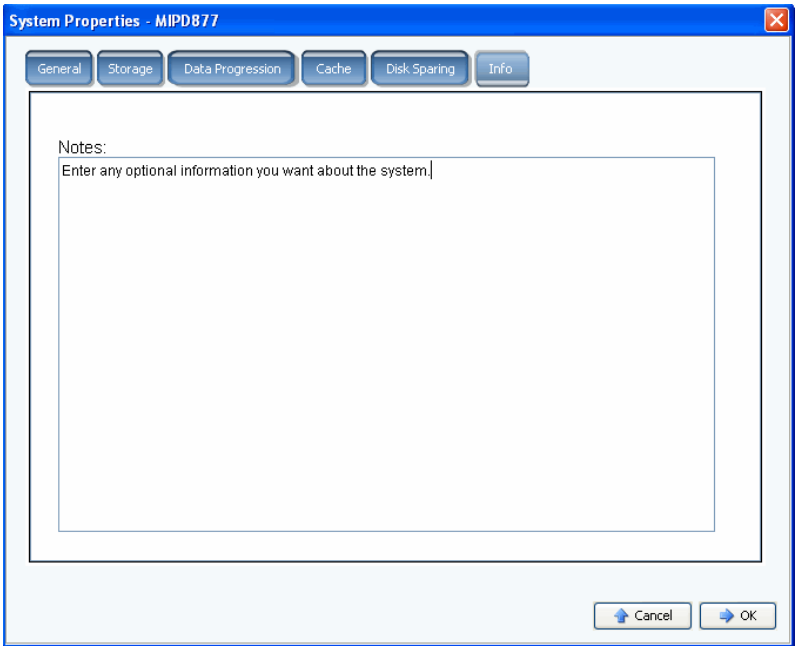


Figure 195. System Properties – Info

3 Enter optional information about the system.

4 Click **OK** to save changes.

Finding Unmanaged Hardware

1 From the Storage Management menu, choose **System > Find Unmanaged Hardware**. System Manager displays the Unmanaged Hardware window.

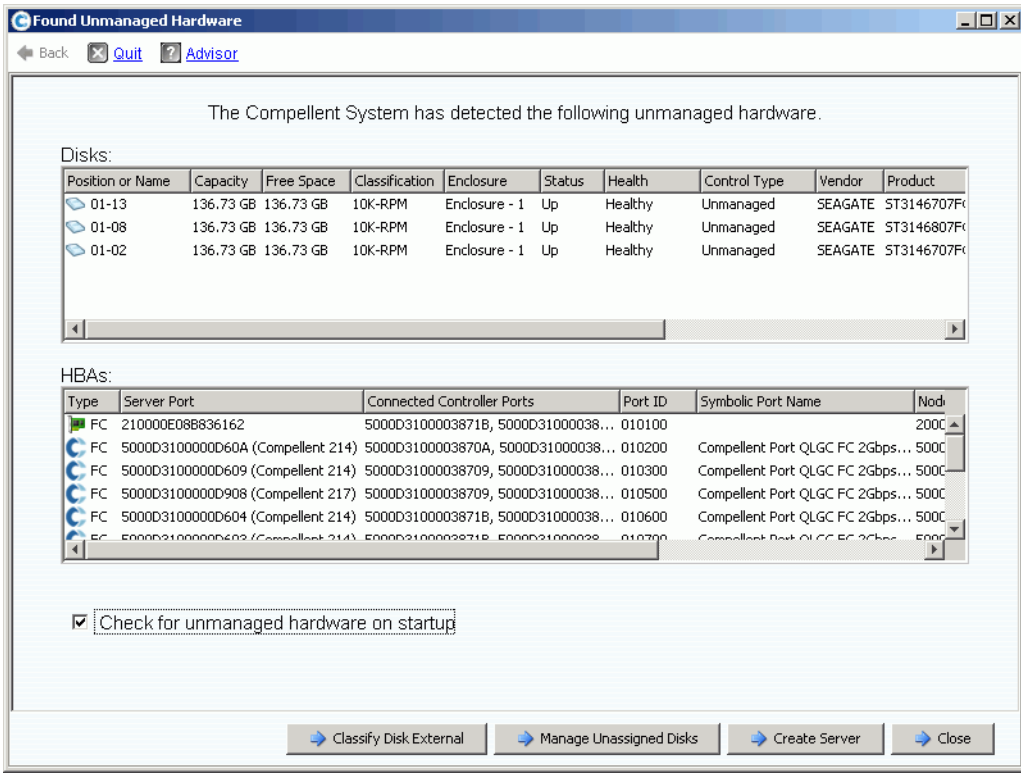

Found Unmanaged Hardware
Back
Quit
Advisor
The Compellent System has detected the following unmanaged hardware.
Disks:
Position or Name
Capacity
Free Space
Classification
Enclosure
Status
Health
Control Type
Vendor
Product
01-13 136.73 GB 136.73 GB 10K-RPM Enclosure - 1 Up Healthy Unmanaged SEAGATE ST3146707F
01-08 136.73 GB 136.73 GB 10K-RPM Enclosure - 1 Up Healthy Unmanaged SEAGATE ST3146807F
01-02 136.73 GB 136.73 GB 10K-RPM Enclosure - 1 Up Healthy Unmanaged SEAGATE ST3146707F
HBAs:
Type
Server Port
Connected Controller Ports
Port ID
Symbolic Port Name
FC 210000E08B836162 5000D3100003871B, 5000D31000038... 010100
FC 5000D3100000D60A (Compellent 214) 5000D3100003870A, 5000D31000038... 010200 Compellent Port QLGC FC 2Gbps...
FC 5000D3100000D609 (Compellent 214) 5000D31000038709, 5000D31000038... 010300 Compellent Port QLGC FC 2Gbps...
FC 5000D3100000D908 (Compellent 217) 5000D31000038709, 5000D31000038... 010500 Compellent Port QLGC FC 2Gbps...
FC 5000D3100000D604 (Compellent 214) 5000D3100003871B, 5000D31000038... 010600 Compellent Port QLGC FC 2Gbps...
Check for unmanaged hardware on startup
Classify Disk External
Manage Unassigned Disks
Create Server
Close

Figure 196. Unmanaged Hardware

Finding Unmanaged Hardware at Startup

To check for unmanaged hardware at startup, in the Unmanaged Hardware window, shown in Unmanaged Hardware on page 237, select **Check for Unmanaged Hardware at Startup.**

To Classify a Disks as External

1 Click **Classify Disk External**.

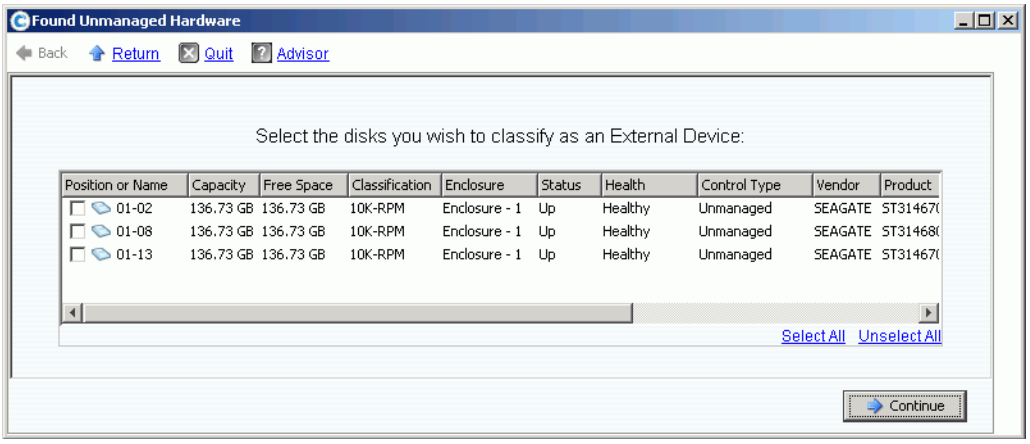


Figure 197. Classify Disks as External

2 Select disks to classify disks as external. For example, you may have disks from a heritage system that you can replicate to or from.

3 Click **Continue**. A window appears asking for a name for each disk you selected.

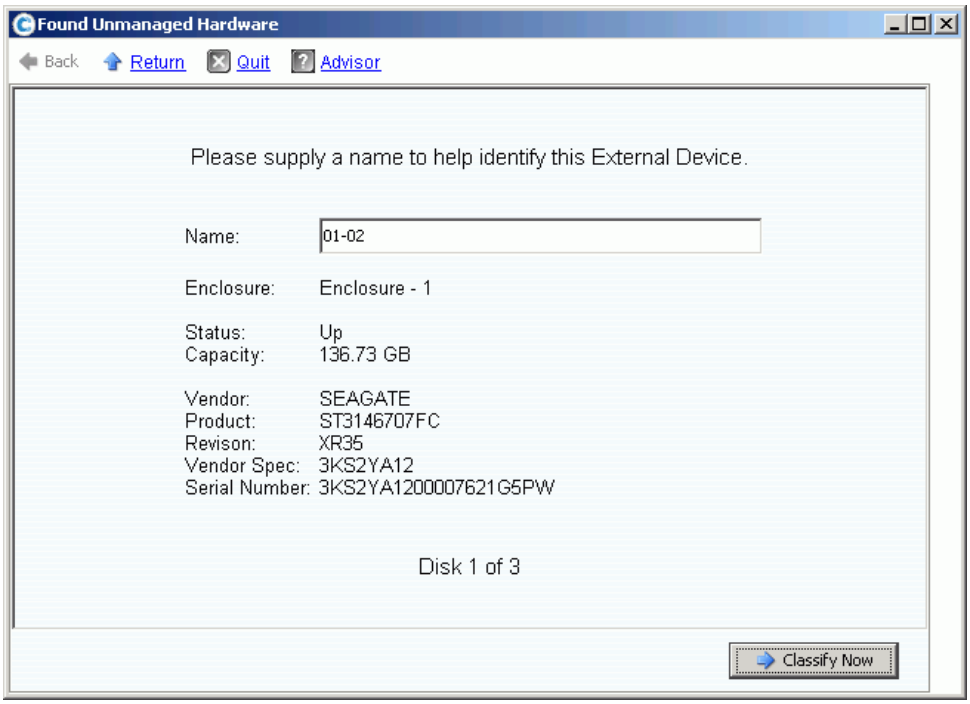


Figure 198. Name External Device

4 Enter a name to identify each External Device.

5 Click **Classify Now**. If you selected more than one disk to classify as an external device, the Name External Device window reappears. When all disks have been classified as external and named, the Unmanaged Hardware window reappears. The system adds an External Disk folder to the disk folder tree.

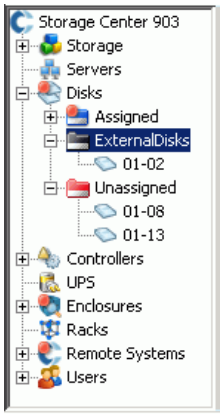


Figure 199. System tree with External Disk Folder

Once the disk is classified as an external device, you can:

- Restore Volume from External Device
- Import a Volume from External Device
- Delete

Viewing Background Processes

Many Storage Center tasks, such as Replications, run as background processes. Monitor and manage these processes from the **Background Processes** view.

1 Select **Background Processes** from the **View** menu.

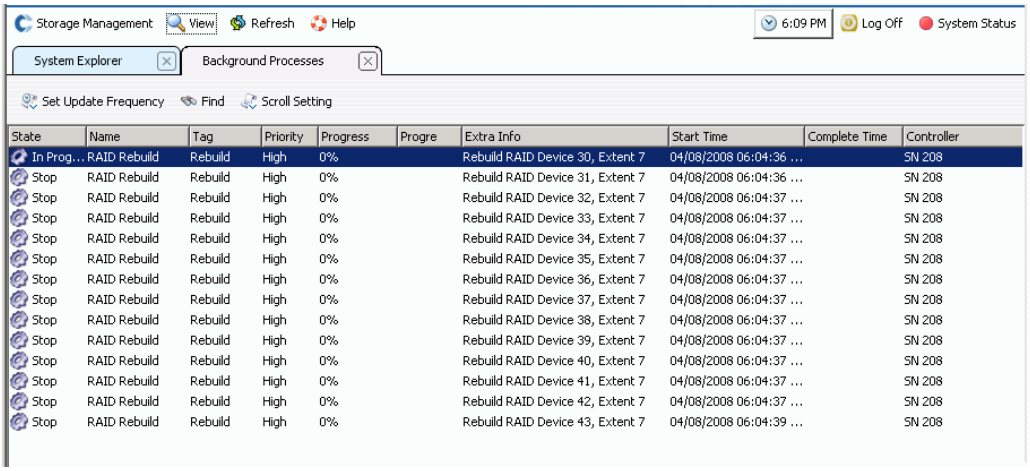

Storage Management
View
Refresh
Help
6:09 PM
Log Off
System Status
System Explorer
Background Processes
Set Update Frequency
Find
Scroll Setting
State Name Tag Priority Progress Progre Extra Info Start Time Complete Time Controller
In Prog... RAID Rebuild Rebuild High 0% Rebuild RAID Device 30, Extent 7 04/08/2008 06:04:36 ... SN 208
Stop RAID Rebuild Rebuild High 0% Rebuild RAID Device 31, Extent 7 04/08/2008 06:04:36 ... SN 208
Stop RAID Rebuild Rebuild High 0% Rebuild RAID Device 32, Extent 7 04/08/2008 06:04:37 ... SN 208
Stop RAID Rebuild Rebuild High 0% Rebuild RAID Device 33, Extent 7 04/08/2008 06:04:37 ... SN 208
Stop RAID Rebuild Rebuild High 0% Rebuild RAID Device 34, Extent 7 04/08/2008 06:04:37 ... SN 208
Stop RAID Rebuild Rebuild High 0% Rebuild RAID Device 35, Extent 7 04/08/2008 06:04:37 ... SN 208
Stop RAID Rebuild Rebuild High 0% Rebuild RAID Device 36, Extent 7 04/08/2008 06:04:37 ... SN 208
Stop RAID Rebuild Rebuild High 0% Rebuild RAID Device 37, Extent 7 04/08/2008 06:04:37 ... SN 208
Stop RAID Rebuild Rebuild High 0% Rebuild RAID Device 38, Extent 7 04/08/2008 06:04:37 ... SN 208
Stop RAID Rebuild Rebuild High 0% Rebuild RAID Device 39, Extent 7 04/08/2008 06:04:37 ... SN 208
Stop RAID Rebuild Rebuild High 0% Rebuild RAID Device 40, Extent 7 04/08/2008 06:04:37 ... SN 208
Stop RAID Rebuild Rebuild High 0% Rebuild RAID Device 41, Extent 7 04/08/2008 06:04:37 ... SN 208
Stop RAID Rebuild Rebuild High 0% Rebuild RAID Device 42, Extent 7 04/08/2008 06:04:37 ... SN 208
Stop RAID Rebuild Rebuild High 0% Rebuild RAID Device 43, Extent 7 04/08/2008 06:04:39 ... SN 208

Figure 200. Background Processes

For each background process, the System Manager displays:

- **Background process state**
- **Name**
- **Tag**
- **Priority**
- **Progress**
- **Progress Message**
- **Extra information**
- **Start Time**
- **Completion Time**
- **Controller**: on which the background process is being run

Phoning Home

Phone Home sends a copy of a Storage Center configuration to Dell Support Services to enable them to support a system. The initial configuration is sent to Dell Support Services when the Storage Center system is installed. If you have questions about your system, Phone Home to report your current configuration.

The **Phone Home** wizard initiates Phone Home process, and displays whether a Phone Home process is in progress. To initiate the Phone Home process, Select **Phone Home Now**. If you select Phone Home Now while a Phone Home process is already in progress, you will be warned and given the opportunity to restart the Phone Home process. Once the initial Phone Home process is finished, you can start another Phone Home by selecting Phone Home Now.

To Phone Home immediately

From the Storage Management menu, choose **System > Phone Home > Phone Home**. The **Phone Home** wizard displays the status of each of the items that are being phoned home. Items that are being phoned home display **In Progress**. Once completed, this state changes to **Success** if the Phone Home is successful, or **Failure** if the Phone Home could not be completed.

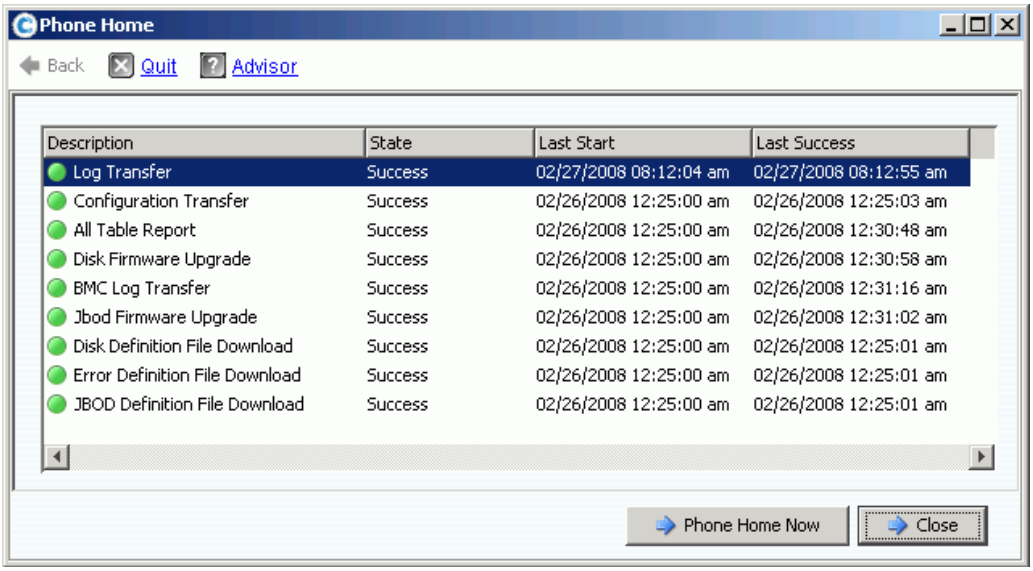


Figure 201. Phone Home

Depending upon the status of the system, some items may not be phoned home. These items display a State of Never Run. To view whether a Phone Home is currently in progress, check the State column. If any items have a state of In Progress, this means a Phone Home is currently in progress.

1. From the Storage Management menu, select **System > Phone Home > Phone Home**. The system displays previous Phone Home events.
2. Click **Phone Home Now**. System Manager informs you that Phone Home is started.
3. System Manager informs you that the log was successfully transferred.

To view the Phone Home Now schedule

From the View menu, select **Scheduled Events**. The Scheduled Events window appears.

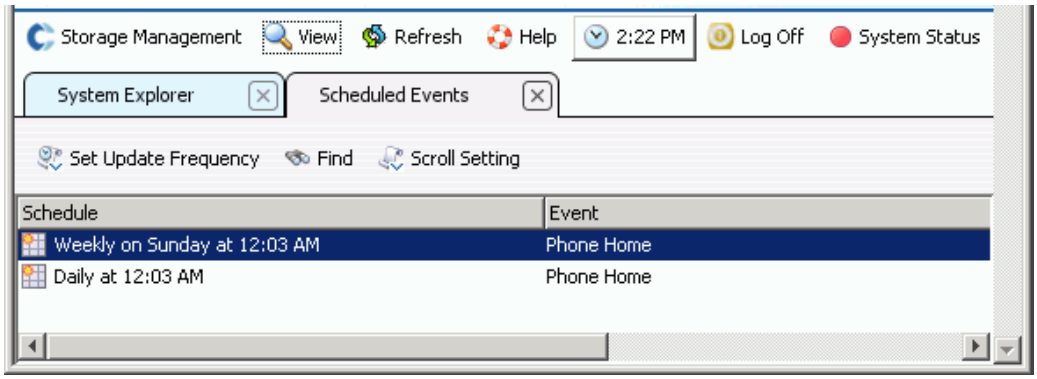


Figure 202. Scheduled Events

To configure Phone Home proxy (optional)

If you will use a proxy server in your network, configure the Phone Home Proxy Server:

1. From the Storage Management menu, select **System > Phone Home > Configure Phone Home Proxy**. The Phone Home Proxy window appears.
2. Select the **Use Phone Home Proxy Server** checkbox.
3. Enter the **IP address** of the proxy server, the port, user name, and password to be used when connecting to the proxy server. Confirm the password.
4. Click **OK**.

Viewing the System Log

The System Log is a record of all status messages from the system.

1. From the **View menu,** choose **System Log**. The Filter Log Messages window appears.
2. Use the filter log dropdown menus to filter the content of the log to be retrieved. Choose from the following:
   - Date and time between which to view logs
   - Message level greater than, lesser than, or equal to a Warning, Configuration, or Debug
   - In a multi-controller system, name of controller
   - Subsystem
   - Select or clear checkbox to display system level messages.
3. Click **OK**.

Responding to the Alert Monitor

Alerts warn you when Storage Center requires attention. The current status of the Storage Center is indicated by the color of the System Status icon in the top-right corner of the System Manager software.

Alert indicators

Alerts occur in various types depending upon the area of the Storage Center affected. The type of the alert is indicated by the icon that appears before the alert message.

- Red (Critical): The System Status icon is red when an alert exists that has a status of Down, Critical, or Emergency. When the System Status icon is red, this indicates a condition that requires immediate attention.
- Yellow (Warning): The System Status icon is yellow when an alert exists that has a status of Degraded or Unavailable. This indicates a condition of which you should be aware, but which does not require immediate attention.
- Green (Normal): The System Status icon is green when no alerts exist, when the only alerts that exist are to inform you. The System Status icon returns to green when all alerts higher than Inform are acknowledged.

Alert Categories

- **Alert:** This category contains normal alerts. These alerts represent current issues present on the Storage Center. They are also being actively monitored by the system, and will clear themselves automatically should the situation that has caused them corrects itself. Once an alert of this type becomes cleared, a record that it occurred can be found under the Alert History category.
- **Indication:** This category contains alerts that are for informational purposes only. These alerts exist to warn you about a condition on the Storage Center that may require direct user intervention to correct.
- **Maintenance:** This category contains any alerts that occur while the Storage Center's Operation Mode is set to Install, Maintenance, or PreProduction. This category exists to isolate these alerts from alerts that occur during normal operation.
- **History:** This category contains a history of the normal alerts that appeared and were cleared automatically. This category exists to allow you to keep a record of any past conditions that have occurred on the Storage Center.

Alert Status

Down: Alerts with an alert status of Down indicate that an item on the Storage Center is down and not currently operational.

Critical: Alerts with an alert status of Critical indicate that an item on the Storage Center is in a critical state and may be nearing failure.

Emergency: Alerts with an alert status of Emergency indicate that an item on the Storage Center requires immediate attention in order to remain operational.

Degraded: Alerts with an alert status of Degraded indicate that an item on the Storage Center is currently operating in a degraded mode. Items in this condition may operate in degraded mode indefinitely, but are not functioning to their full capability.

Unavailable: Alerts with an alert status of Unavailable indicate that an item on the Storage Center that is expected to be present cannot currently be found for use.

Inform: Alerts with an alert status of Inform provide information regarding some operation that is occurring or has occurred on the Storage Center.

Complete: Alerts with an alert status of Complete indicate that an operation on the Storage Center has completed.

Viewing the System Alert Monitor

1 Click **System Status** at the top of the System Explorer. The **Alert Monitor** view appears.

2 Click the **Alerts folder** to view all alerts.

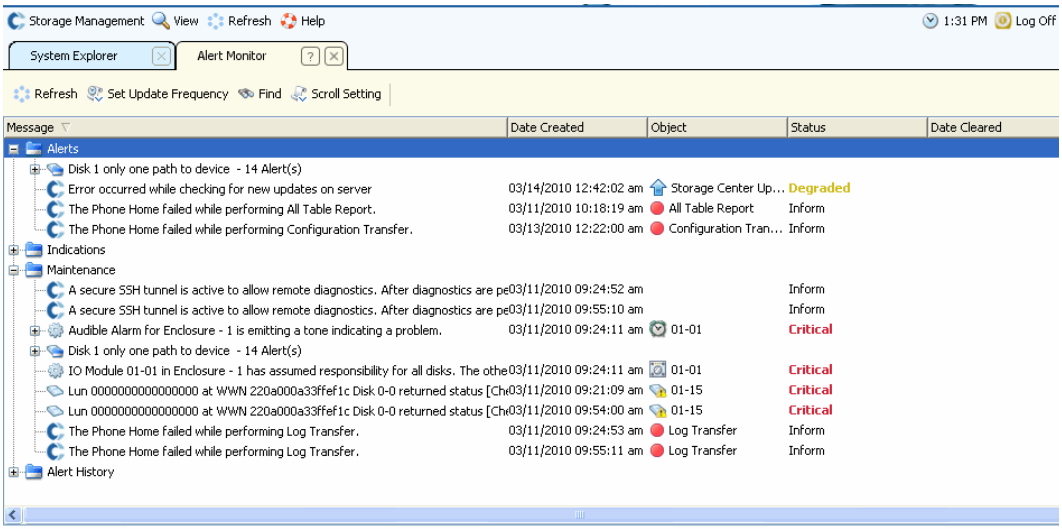


Figure 203. Alert Monitor

Selecting an alert displays additional information about the system message.

- To view more information about an alert, select an alert. The shortcut menu displays additional commands for the alert. For example, **Show** displays the object in the System Manager. Some alerts do not have a related object to be shown. For these alerts, the Object column is blank.
- To acknowledge an alert, select **Acknowledge**. Acknowledging an alert acknowledges it for all users.
- **Properties** displays additional information. Click the **Advanced tab** in the Alert Properties window to display a Reference number. The Reference number may be important for communication with Dell Support Services.

Acknowledged Alerts

Alerts in the Alert and Maintenance categories can be acknowledged to indicate to the Storage Center that you have read the alert message and are aware of the problem. Once all alerts have been acknowledged, the System Status icon will return to the green (normal) state until additional alerts occur.

Alert Deletion

Alerts in the **Indication** and **Alert History** categories can be deleted. Once an alert is deleted, it cannot be recovered.

Finding More Information About an Alert

Many alerts are associated with items that can be monitored in other areas of the System Manager software. These items are displayed in the **Object** column. To see more information about one of these objects, select the alert and then select the **Show** button in the **Alert Monitor** toolbar.

For example, if you have an alert indicating that New Volume 1 is down, you can select that alert, then select the Show New Volume 1 in System Explorer button. The System Explorer will be brought forward and New Volume 1 will be selected.

Space Warnings

Conservation Mode

Storage Center enters **Conservation Mode** when remaining free space reaches 32 GB (or less for systems smaller than 3.2 TB). When Storage Center enters **Conservation Mode**, the system generates a **Conservation Mode Alert** to inform you that the system will not allow new volumes to be created and that it will begin to aggressively expire Replays. The **Conservation Alert** is close to the boundary where space is exhausted to keep these actions from being performed unless necessary. Because of its proximity to the emergency threshold, it is not a tool to manage storage, and should not be used to plan adding additional disks to the system.

Emergency Mode

Emergency threshold means that the system can no longer operate because there is no more free space. Storage Center:

- Generates an **Emergency Alert**
- Expires Replays early
- Will not permit new volumes to be created
- All volumes are taken offline

When Storage Center reaches the **Emergency** threshold, all server IO is rejected until the system gets out of **Emergency Mode**. Because this is service affecting, special care should be taken to monitor free space on the system to avoid reaching this threshold. Volumes will not be able to be brought back online until enough space is freed to exit the emergency state. Before a system reaches **Emergency Mode**, it is critical that you add space.

Monitoring Storage Space

Storage Center sends an Alert when additional space is required. The Storage Center:

- Automatically monitors the amount of space used and the amount of space remaining on a Storage Center, both as a percentage of space and an absolute value
- Automatically allocates disk space for volumes to use as needed
- Notifies you when remaining free space falls below the Storage Alert Threshold

Storage Center groups all disks in a managed Disk Folder into one common pool of storage. Volumes draw space from the common pool. Each volume simultaneously uses all of the disk drives in the shared storage pool for improved data access rates.

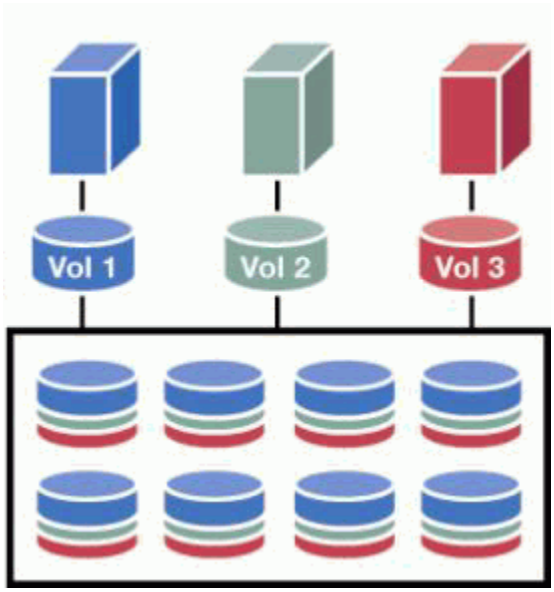


Figure 204. Shared Storage Pool

Note An exception to the efficient pool of storage is created when disks are assigned to a second Managed Disk Folder or volumes are created with non-standard datapage sizes or redundancy. To take full advantage of Dynamic Capacity, assign all disks to one Managed Disk Folder using standard Storage Type volumes.

Space is allocated from the shared storage pool as new volumes are created, additional data is stored on volumes, and Replays are taken and stored.

Changing the Storage Alert Threshold

The Low Space Threshold is that percentage of available storage below which the system alerts you to add more disks. By default, the Storage Alert Threshold is set at 10% of available storage.

Storage Center allocates disk space from a disk folder for volume and replay use as needed based upon the configurations and IO patterns of each volume. As the Storage Center approaches the end of the disk space available within the disk folder, you are notified of the possibility that you could run out of space. This notification indicates that you are in a Space Low state. The notification occurs when space available falls below the Storage Alert Threshold.

To change the storage alert threshold

1 From an assigned disk folder shortcut menu, select **Properties**. (Your assigned disk folder may have a different name.) The **Disk Folder Properties** window appears.

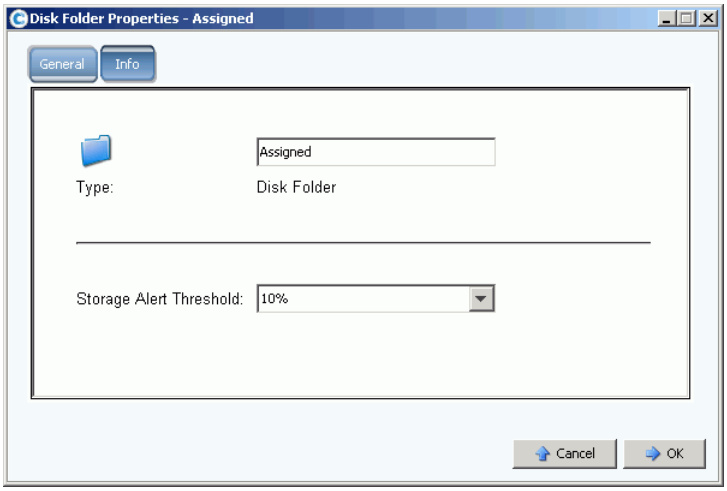


Figure 205. Disk Folder Properties

2 In the General window, select a Storage Alert Threshold, from 6% to 15%. If available storage space falls below this number, an alert is generated to warn you that space is low.

Adding Space

The following mechanisms can increase available space:

- Add Disks

  The solution to insufficient storage is to add disks or enclosures to the system. For information on adding disks to a system, refer to Adding Disks to a Storage Center System on page 116.

  After disks are added to a system, the space may not be immediately available. Make sure that you allow enough time for the system to prepare disks to be used to store data.

- Delete Unused Volumes

  Delete unused volumes. (An unused volume is not an empty volume.) For information about deleting unused volumes, refer to Deleting a Volume on page 89.

- Empty the Recycle Bin

  Make sure that the **Recycle Bin** is empty. Space from deleted volumes is not recovered until the Recycle Bin is empty. Select the **Recycle Bin**. From the shortcut menu, select **Empty Recycle Bin**.

- Expire Replays

Expire Replays that are not needed. For more information, refer to Expiring a Replay Explicitly on page 312. Select each volume separately, and expire Replays from the **Replay** tab.

- Use Enterprise Manager

  The Enterprise Manager Server Agent Space Recovery program finds and recovers unused disk space as reported by Windows. For more information, refer to the ***Enterprise Manager User Guide***.

Adding a Controller

The ability to add controllers to a system is a separately licensed feature. Adding controllers to a system increases fault tolerance and the ability to divide system load across clustered controllers. All controllers in the clustered-controller system must have the same physical connectivity to servers and storage enclosures to be able to share workload.

1 From the Storage Management menu, choose **System > Setup > Multi-Controller > Add Controller to System.** The **Add Controller to System** window appears.

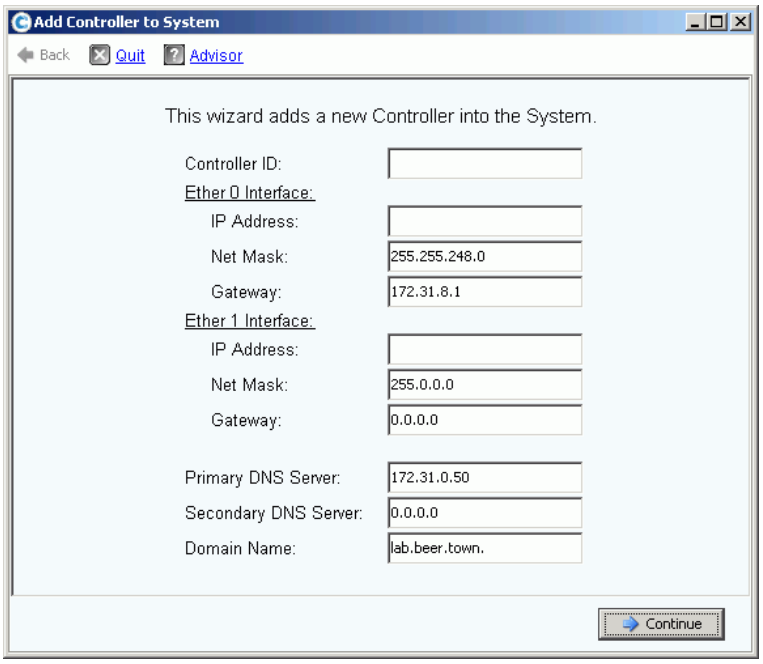


Figure 206. Add Controller to System

Caution: All System and configuration data is lost on the controller being added when the Add Controller command is accepted by the added controller.

2 Enter **Controller ID**. This is serial number of the controller — numbers only.

3 Enter a valid Eth0 **IP Address**. (To view the Eth0 IP address, refer to Viewing Controller Properties on page 144.)

Note To find the Controller ID and IP Address, in the system tree right-click on the system node. From the shortcut menu, select Properties.

4 Enter the **IP address of the DNS** server, if you use one. Optionally, you can add the address of a second DNS server.

5 Click **Continue**. A confirmation window appears.

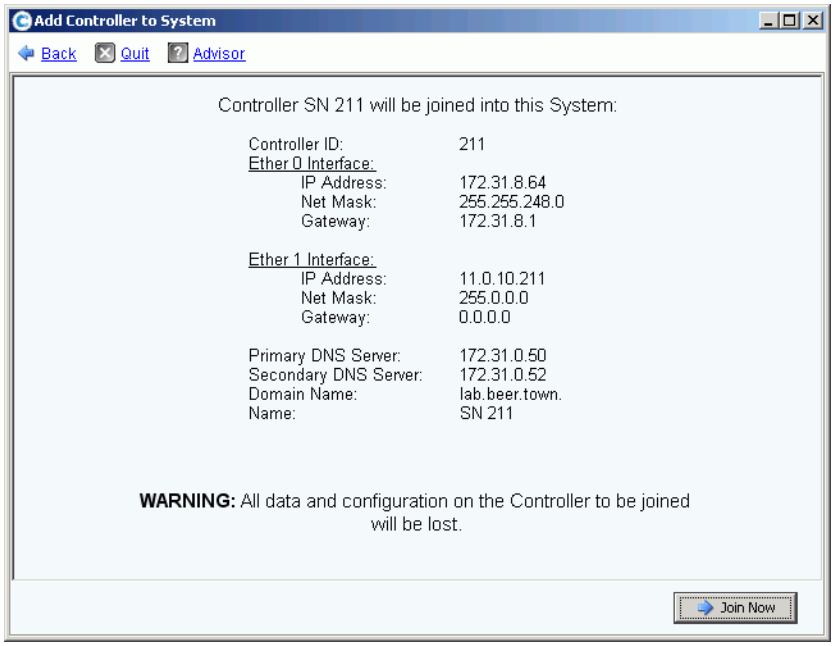


Figure 207. Confirm Add Controller

6 If everything is accurate, click **Join Now**. The system joins the controller. When the added controller is joined, Storage Center closes the System Manager and opens the **Startup** wizard.

- If there are iSCSI HBAs, continue with Configuring iSCSI IO Cards on page 211.
- If there are no iSCSI HBAs, continue with Configuring Local Ports on page 201.

Shutting Down and Restarting

You cannot shutdown until all controllers are in the **Up** state. The system ensures that the system shuts down elegantly.

Shutting Down a System

1 From the from the Storage Management menu, select **System > Shutdown/Restart**. A window appears with a drop down menu that allows you to choose between **Restart** and **Shutdown**.

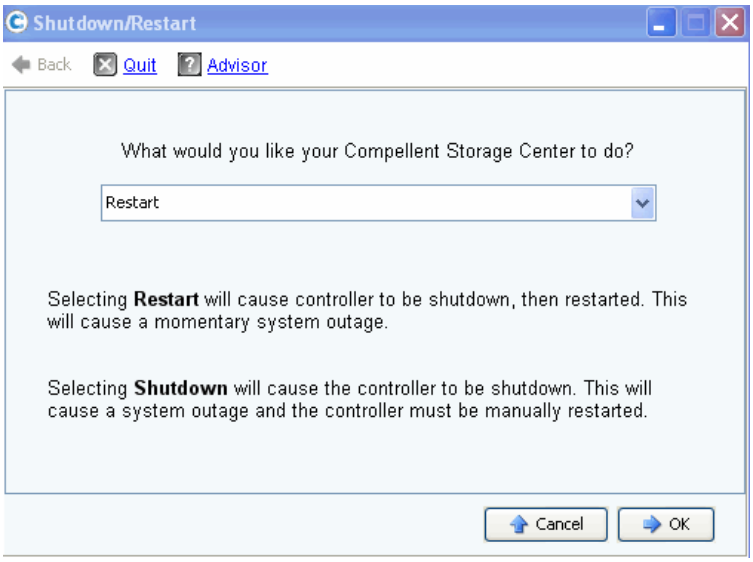

Shutdown/Restart
Back
Quit
Advisor
What would you like your Compellent Storage Center to do?
Restart
Selecting Restart will cause controller to be shutdown, then restarted. This will cause a momentary system outage.
Selecting Shutdown will cause the controller to be shutdown. This will cause a system outage and the controller must be manually restarted.
Cancel
OK

Figure 208. Shutdown/Restart window

Restarting a System

1 From the from the Storage Management menu, select **System > Shutdown/Restart**.

2 For a dual-controller system, choose **Restart in Sequence** or **Restart Simultaneously.**

- **Restart in Sequence** does not cause a system outage. Storage Center shuts down the first controller, and then restarts the first controller. When the first controller is up, Storage Center shuts down and restarts the second controller. Ports will be unbalanced and System Manager will ask you to re-balance the ports.
- **Restart Simultaneously** shuts both controllers down simultaneously and then brings them back on line. This causes a system outage. When the controllers are restarted, they may or may not be unbalanced.

Upgrading Storage Center Software

Component updates for Storage Center are bundled together as one downloadable update package.

Understanding the Update Process

Storage Center can be configured to automatically check for update packages and download update packages as a background process. Once an available update package is downloaded, a Storage Center administrator validates the update package and manages the installation of update components included in the package.

Updating Storage Center consists of these general steps:

1. Getting an update package. Refer to Getting an Update Package on page 253.
2. Viewing update package details. Refer to Viewing Update Package Details on page 257
3. Deciding how to apply updates. Refer to Deciding How to Apply Updates on page 258
4. Validating update components.
5. Applying updates to the Storage Center.
6. Checking the installation report.

Getting an Update Package

By default, a new Storage Center is configured to automatically check for update packages. An upgraded Storage Center retains the existing configuration setting for Automatic Updates. This section describes how to control the processes of Check Update and Download Update:

Note Once downloaded, package updates are not automatically installed. A user with administrator must validate and then initiate installation of an update package.

Configuring Automatic Updates

1. From the Storage Management menu, select **System > Update > Configure Automatic Updates**. The **Configure Automatic Updates** dialog appears.
2. Select the update option:
   - **Do not automatically check for software updates:** Select this option to disable automatic checking for updates.
   - **Notify me of a software update but do not download automatically:** Select this option to automatically check for updates and receive notification when an update is available. Updates are not downloaded until you explicitly download the update.
   - **Download software updates automatically and notify me:** Select this option to automatically download updates and receive notification when the download is complete.
   - **Never check for software updates (Phone Home not available):** Select this option to prevent the system from ever checking for updates either automatically or manually. This option is for secure sites at which Phone Home is not available.

3 Click **OK**.

Update Component Types

Within an update package, an individual update component is classified by how the update component can be installed:

- **Required** or **Deferrable**: Required components must be installed as part of the update; Deferrable components can be installed at a later time.
- **Service Affecting** or **Service Optional**: Service Affecting components can be installed only when the Storage Center is temporarily taken out-of-service to perform the update; Service Optional components can be installed either when the Storage Center is in service or during a scheduled outage.

The following table shows which components affect service during installation.

	Service Affecting	Service Optional
Storage Center with Single Controller		
Storage Center Firmware Update	☑	
** Enclosure Firmware Update	☑	☑
Disk Firmware Update	☑	
Storage Center with Clustered Controllers		
Storage Center Firmware Update		☑
**Enclosure Firmware Update	☑	☑
Disk Firmware Update	☑	

** Only the following enclosure firmware allow **Service Optional** installation:

- FC SBOD enclosures, Model EN-SB4X16
- FC SATA enclosures, Model EN-SA2X16

All other enclosure firmware installation is **Service Affecting**.

Getting an Update Package

By default, a new Storage Center is configured to automatically check for update packages. An upgraded Storage Center retains the existing configuration setting for Automatic Updates. This section describes how to control the processes of **Check Update and Download Update**.

Note Once downloaded, package updates are not automatically installed. A user with administrator must validate and then initiate installation of an update package.

To manually check for available updates

1 From the Storage Management menu, select **System > Update > Update Status**. The Update Status dialog appears.

2 Click **Check Now**. As Storage Center checks for updates, status appears in the Update Status dialog.

When Storage Center is finished checking for updates, the results are displayed in the Update Status dialog. See Checking Update Status on page 255 for details on the Update Status dialog.

To manually download an available update

1 From the Storage Management menu, select **System > Update > Update Status**. The **Update Status** display appears.

2 Click **Download Now**.

As Storage Center downloads the update, status appears in the **Update Status** display. When Storage Center is finished checking for updates, the results are displayed in the **Update Status** dialog.

Checking Update Status

From the Storage Management menu, select **System > Update > Update Status**. The **Update Status** display appears, showing current status information.

Refer to the following table for details on all possible messages in **Update Status** display:

Field	Description
Current Update Status	Current status of the **Check Update**, **Download Update**, or **Install Update** process: • **Checking for Update:** Storage Center is currently checking for updates. • **Controller Down:** A controller is down. Installation cannot proceed when a controller is down. • **Downloading Update:** Storage Center is currently downloading an update. • **Error Checking or Downloading:** An error occurred during Check Update or Download Update. • **Error Installing Update:** An error occurred while installing an update component. Click Install Report to view details on the installation error. • **Installing Update:** Storage Center is currently installing an update. • **No Updates Available:** Last Check Update process found no available updates. Click **Check Now** to check again for updates. • **Update Available for Download:** An update is available for download. Click Download Now to download the update. • **Update Ready to Install:** A downloaded update is ready to install. Click Install Update to install the update. • **Validating Components:** Storage Center is currently verifying each component status to determine if a component is ready for installation.
Current Package Version	Package version currently running on the Storage Center.
New Package Version	Package version of the package ready to download or install.
Service Affecting	Indicates whether package installation affects Storage Center service: • **Yes:** Package installation affects Storage Center service. • **No:** Package installation does not affect Storage Center service. • **Deferrable:** Package contains service-affecting components that can be installed at a later time.

Field	Description
Controller Reset	Indicates whether the update package installation requires restarting the controllers: • **For a single-controller Storage Center:** restarting the controller always affects service. • **For a clustered-controller Storage Center:** If the upgrade is service-affecting, the controllers are restarted simultaneously. If the upgrade is not service-affecting, the controllers are restarted in sequence.
Last Check Time	Shows the date and time when Storage Center last successfully checked for updates.
Validation Errors	Shows the number of validation warnings or errors, if any, encountered during a Validate Update process.
Installation Errors	Shows the number of installation errors and warnings, if any, that occurred during installation.

Update Status Actions

Depending on the reported status, the following buttons appear:

Click …	To …
Check Now	Check for updates.
Validate Components	Validate update components.
Install Update	Install the downloaded update package.
Details	View details for a downloaded update package.
Installation Report	View installation warnings and/or errors for the last installation. If no warnings or errors were reported, the Installation Report button is not displayed.

Viewing Update Package Details

When a downloaded update package is ready to install, you can view details for the package prior to installing the package.

To view update package details

1. From the Storage Management menu, select **System > Update > Update Status**. The Update Status dialog appears.
2. Click **Details**. The **Update Details** display appears.

Update Details provide details for all components included in the update package.

Column	Description
Component	Name of component to be updated.
Type	Type of component to be updated: • **Storage Center:** Component updates Storage Center software. • **Enclosure:** Component updates enclosure firmware. • **Disk:** Component updates disk firmware.
Version	Version number of the update component.
Status	Status of the component update: • **Ready for Update:** Component is ready for update. • **Installed:** Component has been installed.
Update Count	Number of components on the Storage Center to which the update component applies. For example, for a controller firmware update, shows 1 for a single-controller Storage Center and 2 for a clustered-controller Storage Center.
Update Type	Indicates whether the installation of the update component is required or deferrable: • **Required:** Update component is required. • **Deferrable Service Affecting:** Update component is deferrable and the component must be installed during a scheduled outage. • **Deferrable Service Optional:** Update component is deferrable and you can select whether to install the component in background when the Storage Center is in service or you can install the component during a scheduled outage.
Message	Shows information messages, if any, that further describe the update component.

Deciding How to Apply Updates

The options available for applying updates to the Storage Center are dependent on the Storage Center configuration (single- or clustered-controller, enclosure types, and disk types) and the update component types included in the update package. Applying updates to the Storage Center can be performed:

- In Service: Components that do not affect service or are service optional can be applied in background mode while the Storage Center is in service. However, the completion of the installation can take significantly more time to complete in-service as compared to installing the components during a scheduled service outage.
- Scheduled Service Outage: Components that affect service must be applied during a scheduled service outage. These components require restarting the Storage Center controllers to complete the installation. Components that are service optional can also be applied during a scheduled service outage to speed up installation.

To decide how to apply updates

1 After downloading an update packages, view the **Update Details**:

   a From the Storage Management menu, select **System > Update > Update Status**. The **Update Status** display appears.

   b Click **Details**. The **Update Details** display appears.

2 In the **Update Details** display, view the **Update Type** column for each component:

For this Update Type …	Apply Update Options Include …
Required	Component must be installed. • For a single-controller Storage Center, the update component affects service. • For a clustered-controller Storage Center, the update component can be performed without disruption of service.
Deferrable Service Affecting	Component installation can be deferred. Applying the update affects service on all systems. Schedule a service outage to apply the update.
Deferrable Service Optional	Component installation can be deferred. Applying the update can be done either without affecting service or during a scheduled service outage.

3 After viewing the **Update Type** for all components included in the update package, determine how to apply the updates:

   • If you intend to install components that affect service, plan for and schedule a service outage during which to apply the updates. You may also want to install components that are service optional during the schedule outage.

If you intend to install components that do not affect service, plan for applying the updates during a time at which the Storage Center is least busy.

8 Users and Groups

Introduction 262
User Privilege Levels 263
Viewing Users 264
Changing User Properties 268
Configuring User Volume Defaults 272
Managing User Groups 277
Managing User Groups 277

Introduction

The purpose of users and user groups is to permit or restrict access to folders, volumes, views, and commands. Access is granted or denied to a user group. Users have access to folders, volumes, and views, depending on their privilege level and the groups to which they belong.

User Privilege Levels

Storage Center has three levels of user privilege:

Administrative User

Admin users have read and write access to the entire Storage Center system. They can can create server and disk folder definitions. Only Admin users can create and delete other users and groups. Admin users have access to all users and groups — there is no restriction on their access.

Note By default, one Administrative user is created when Storage Center is installed. The default User Name of the initial user is Admin. The default password is mmm.

Volume Managers

Volume Managers have access to the folders associated with their assigned user group. They can create volumes in the allowed volume folders and map them to existing servers in the allowed server folders.

Reporters

Reporters have read-only access to the folders associated with their assigned user group.

Viewing Users

In the System Explorer click **Users**. The window displays a list of users.

Figure 209. List of Users

The list displays:

- User name
- If the user is enabled
- Level of privilege
- Full name of user
- Groups to which user belongs

Note Because an Admin user has full privileges, he or she is not restricted to any group.

To view general information about an individual user

Click on the user in the Explorer tree. The window displays information about an individual user.

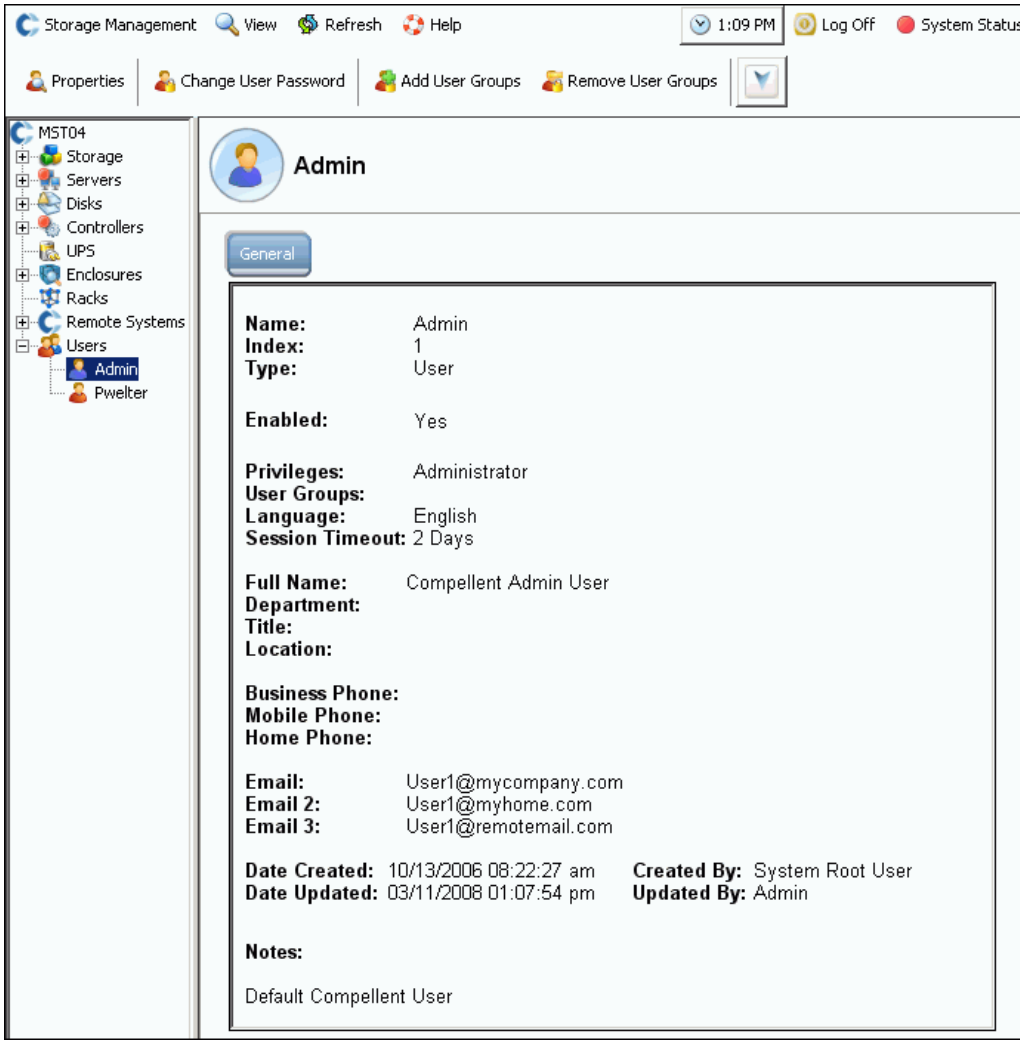


Figure 210. General User Information

General User Information includes:

- **Name**: Of user.
- **Index**: Identification required by Dell Support Services.
- **Type:** Object type - in this case, **User**.
- **Enabled**: Can be **Yes** or **No**. An administrator can disable a user without deleting the user. A disables user cannot log onto the system.
- **Privileges**: **Admin**, **Volume Manager**, or **Reporter**
- **User Groups**: Groups to which this user belongs. Users can belong to more than one group.
- **Language**: Currently, **English**
- **Session Timeout:** Amount of time before automatic timeout.
- User identification, including:

- **Full Name**
- **Department**
- **Title**
- **Location**
- **Business Phone**
- **Mobile Phone**
- **Home Phone**
- Up to three email addresses

- Date user was created and by whom
- Date user was updated and by whom

Creating a User

Note You must have Administrator privileges to create a user.

1 In the system tree, select the **Users** icon.

2 From the shortcut menu, choose **Create User**. The **Create User** window appears.

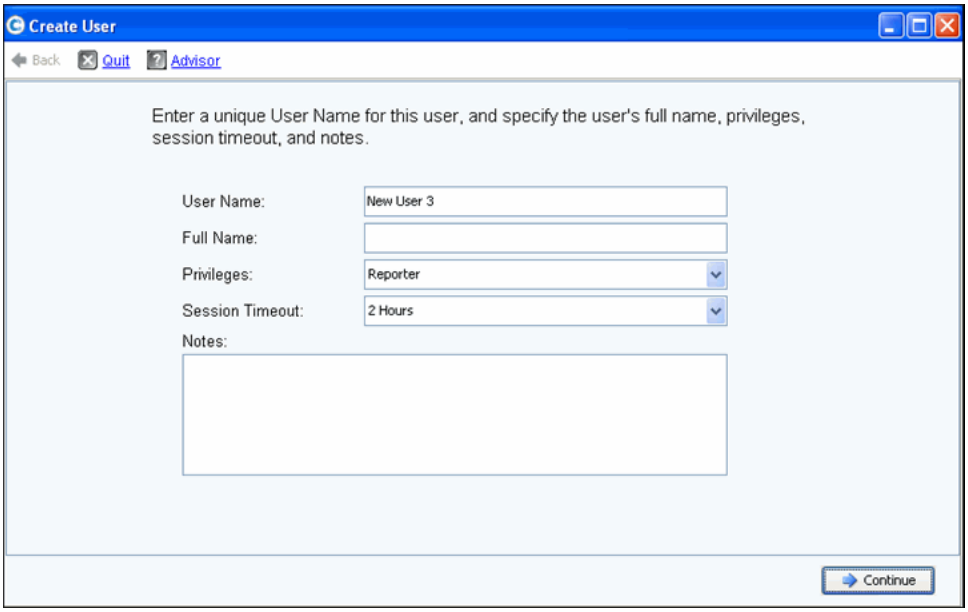


Figure 211. Create User

3 Enter a **User Name** and the **Full Name** of the user.

4 Choose a **Privileges** level for this user. Refer to User Privilege Levels on page 263.

5 Select a **Session Timeout** for this user.

6 Add any optional notes.

7 Click **Continue**. On the next screen, enter the user's email information. This information is used to contact the user when alerts occur. These fields are optional.

8 Click **Continue**. Enter the user's department, title, location, and telephone numbers. These fields are optional.

9 Click **Continue**.

10 Enter and re-enter a **Password** for the new user. A password is required.

11 Click **Continue**.

12 Select **User Group**. (This step is required only if you are creating a non-Administrator User. Admin users do not belong to any User Group.) If a User Group exists on this system, select a User Group. If a User Group has not been created, click Create User Group.

13 Click **Continue**. The system displays the attributes you entered.

14 Click **Create Now**.

Deleting a User

You must have Administrator privileges to delete a user.

Once a user is deleted, that user name cannot be reused for a new user. You can, however, reuse a user name when restoring a user.

1 In the System Explorer, select a **User**.

2 From the shortcut menu, select **Delete**. The system asks you to confirm.

3 Click **Yes**. The user is deleted.

Restoring a User

You must have Administrator privileges to restore a user.

1 From the System Management menu, select **User > Restore Deleted User**. The **Restore Deleted User** window appears.

2 From the list of deleted users, select the user you want to restore. You can only select one user at a time to restore.

3 Click **Continue**.

4 Enter and confirm a new password for the user.

5 Click **Restore Now**. The user is restored and the user name is displayed in the System Explorer.

Changing User Properties

To view or change properties for any user, you must be an Administrative user. If you are a Volume Manager or Reporter, you can change your own properties but you cannot change properties for anyone else.

General User Properties

1 In the System Explorer, select a **User**. From the shortcut menu, select **Properties**. The General User Properties window appears.

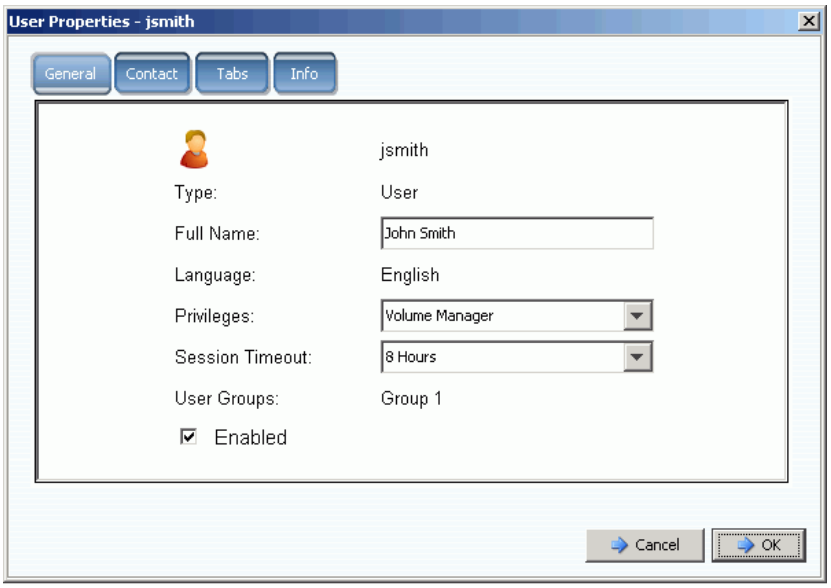


Figure 212. User Properties

2 To change user name, privileges, or session timeout, enter changes. A user with Administrative privileges has access to all user groups. A user with Volume Manager or Reporter privileges may be restricted to a user group.

3 Clear Enabled to deny a user access to the system. A user must be enabled to log into the system.

A user who is disabled cannot log in. If you disable yourself, you will not be able to log in again. If all users are disabled, no one will be able to log in to change the restriction. Everyone, including you, will be locked out of the system.

4 Click **OK**.

User Contact Information

1 In the System Explorer, select a **User**. From the shortcut menu, select **Properties**.

2 Click the **Contact** tab. View or change any of the fields.

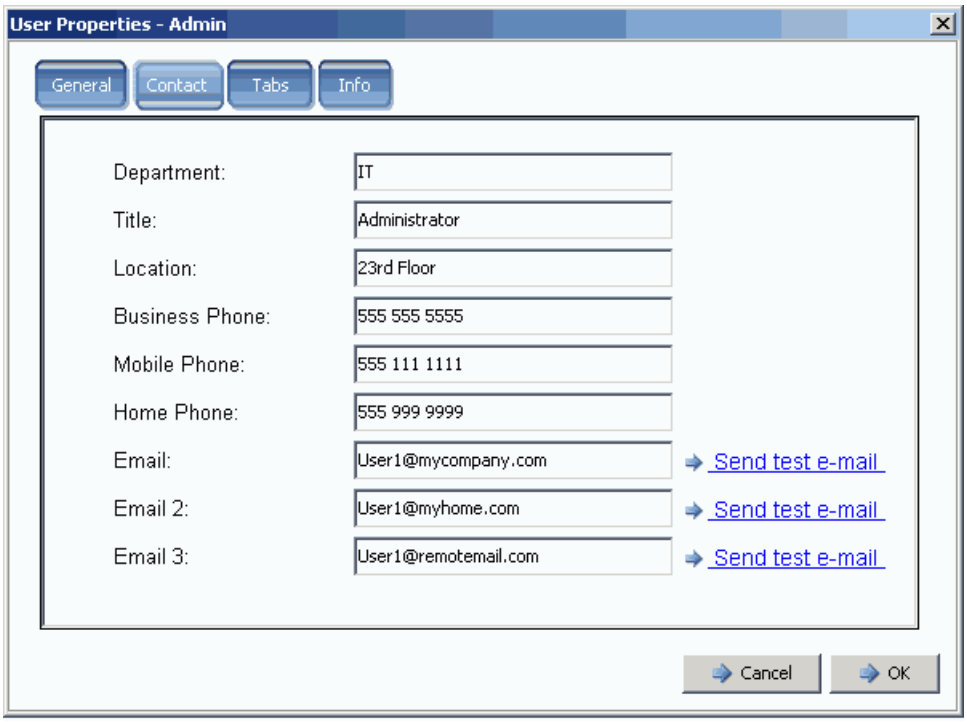


Figure 213. User Contact Properties

3 To send a test email, click test email next to an address. (SMTP must be configured to user system Email. Refer to Configuring SMTP on page 198.)

4 Click **OK**.

User Views

1 In the System Explorer, select a **User**.

2 From the shortcut menu, select **Properties**.

3 Click the **Tabs** tab. The System Manager displays a list of Views to which this user has access.

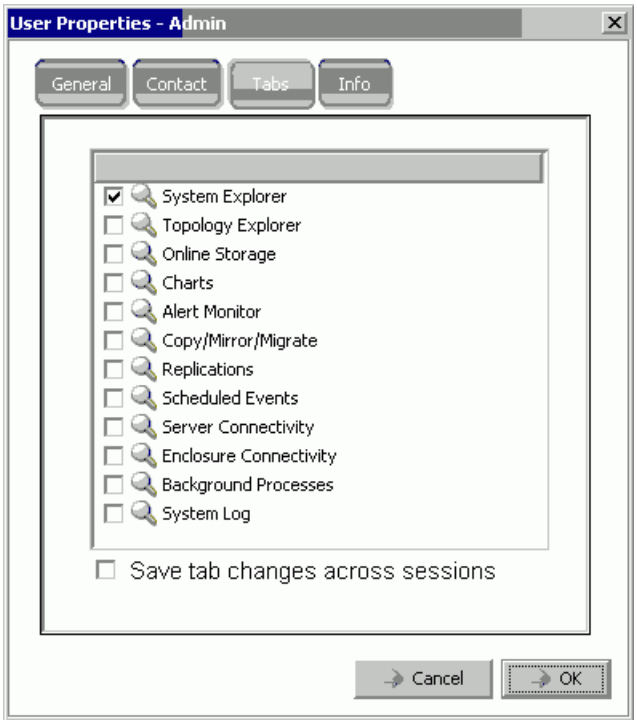


Figure 214. User Viewing Properties

4 Select or clear **Views** to which this user has access.

5 Enable **Save** tab changes across sessions to ensure that the Tab Setting remains after the user logs off the system.

6 Enter any notes (up to 255 characters).

7 Click **OK**.

User Information

1 In the System Explorer, select a **User**.

2 From the shortcut menu, select **Properties**.

3 Click the **Info** tab. The System Manager displays the following information:

- User creation date
- Who created the user
- Last date user properties were updated
- Who updated the user properties

Changing User Password

To change a password for another user, you must have administrator privileges. If you have Volume Manager or Reporter privileges, you can change your own password, but you cannot change the password of another user.

To change a password

1. From the system tree, select a **User**.
2. From the shortcut menu, select **Change User Password**. The **Change User Password** window appears.
3. Enter and re-enter a password.
4. Click **OK**. The password is changed.

Downgrading User Privileges

To downgrade a user, you must delete the User and re-create the User with a new name.

Note You cannot recreate a user with downgraded privileges with the same user name.

1. From the system tree, select a **User**.
2. From the shortcut menu, choose **User > Delete User**.
3. From the system tree, click on **Users** and use the shortcut menu to re-create the user with downgraded privileges and a new user name.

Upgrading User Privileges

1. From the system tree, select a **User**.
2. From the shortcut menu, choose **Properties**.
3. In the **Privileges** field, select an upgraded privilege level.
4. Click **OK**.

Configuring User Volume Defaults

User Defaults affect all levels of users, Administrative, Volume Manager, and Reporter.

- Administrative User can always view the Configure User Volume Defaults and change any default.
- Volume Manager can only change volume defaults if an administrator enables Allow User to Modify Preferences. If this is checked in the General Volume Defaults window, Volume Managers can change their own volume default preferences. If this option is unchecked, the Volume Manager does not have the option to change default preferences.
- Reporter cannot create volumes. This window does not appear for a Reporter.

There are three different User Volume Default commands. Though the windows are similar, each command has a different purpose:

- My User Volume Defaults
- Other User Volume Defaults
- New User Volume Defaults

My User Volume Defaults

As an administrative user, you can always change your own user defaults. This affects the the way in which you create volumes. To streamline the process of creating volumes, you can set defaults for yourself.

If you are a Volume Manager, you can change your volume defaults only if an administrative user enables you to change your defaults in the General Volume Default window. If this option is enabled for you, you can streamline the process of creating volumes by setting Create Volume defaults.

Other User Volume Defaults

If you are an administrative user, you can select one or more current users and change their user volume defaults. If you change an Administrator's volume defaults, when that user logs into a system, the defaults you enabled appear as an initial configuration. That Administrative user can, of course, change these defaults.

As an administrative user, if you disable the option to change create volume defaults for a Volume Manager, that volume manager will not be able to change Create Volume defaults. Specifically, if you disable the option to change these defaults and Advanced Create Volume options are disabled, a Volume Manager will not be able to select non-standard options.

New User Volume Defaults

New user volume defaults apply to users that will be created in the future. This streamlines the process of creating users. If you create Volume Managers and by default disable their ability to change their user volume defaults, they will not be able to change create volume defaults.

Administrative users will be created with New User Volume Defaults, but they can always changes these defaults. New User Volume Defaults are only for new users; defaults are not retroactive.

User Volume Defaults - General

1 From the system tree, select a **User**.

2 From the shortcut menu, select **Configure User Volume Defaults**.

Or, to configure your volume defaults, in the main System Explorer window, select **Configure My Volume Defaults**. The **Configure User Volume Defaults** window appears.

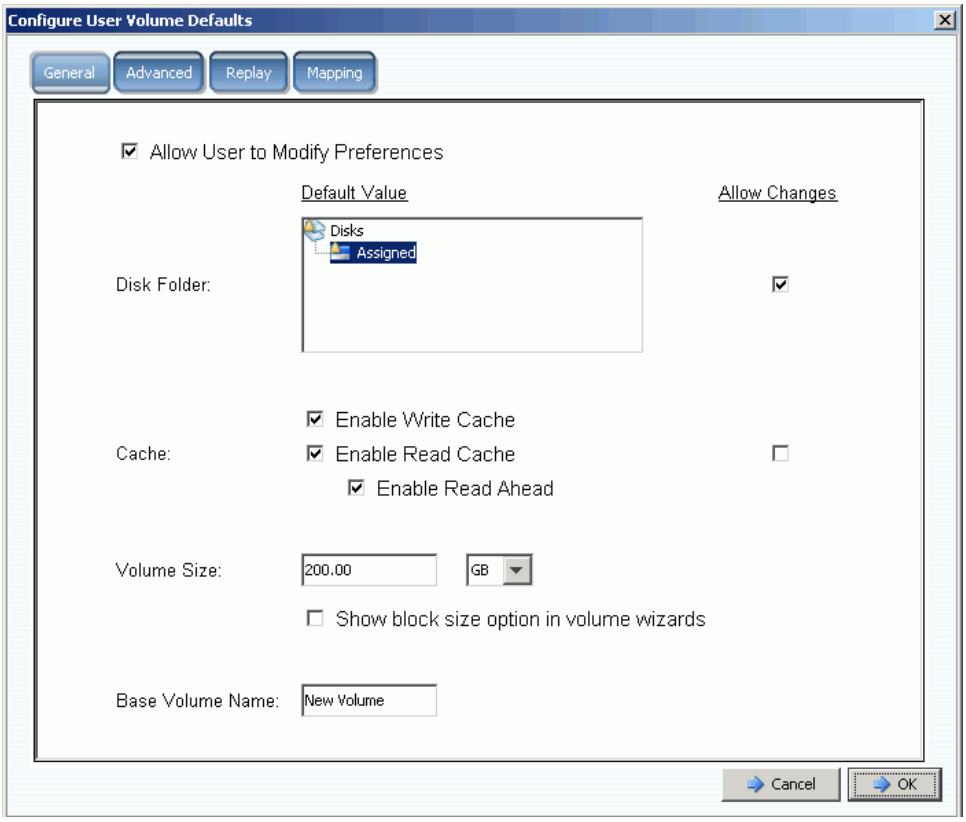


Figure 215. General Configure User Volume Defaults

3 Set these defaults:

- Select or clear **Allow User to Modify Preferences** to permit or disallow a user to change his or her defaults. All users with Administrative privileges can permit or disallow all other users to modify preferences, including their own. If the user has Volume Manager privileges, clearing this field prevent a Volume Manager user from changing other options in the **User Volume Defaults** window.
- Select a **Disk Folder**. Select or clear **Allow Changes** to indicate whether disk folder options are presented to the User when he or she creates a volume.
- Select **Caching** options. Select or clear **Allow Changes** to indicate which caching options are presented to the User when he or she creates a volume.

4 Enter the cache settings for this volume. If caching is disabled for the system, you can enable it for a volume but it will not do any good. However, if cache settings are enabled for the system, you can enable it for an individual volume. Click **Change System Cache Setting** to enable system cache settings.

5 Select or clear **Show block size option in volume wizards**.

6 Enter a default **Base Volume Name**.

7 Click **OK** to save changes.

User Volume Defaults - Advanced

Changing Advanced Volume Defaults can affect adversely the performance of the Storage Center. We strongly recommend you do not change Advanced Volume Defaults.

In the **Configure User Volume Defaults** window, click the **Advanced** tab. The **Advanced User Volume Defaults** window appears.

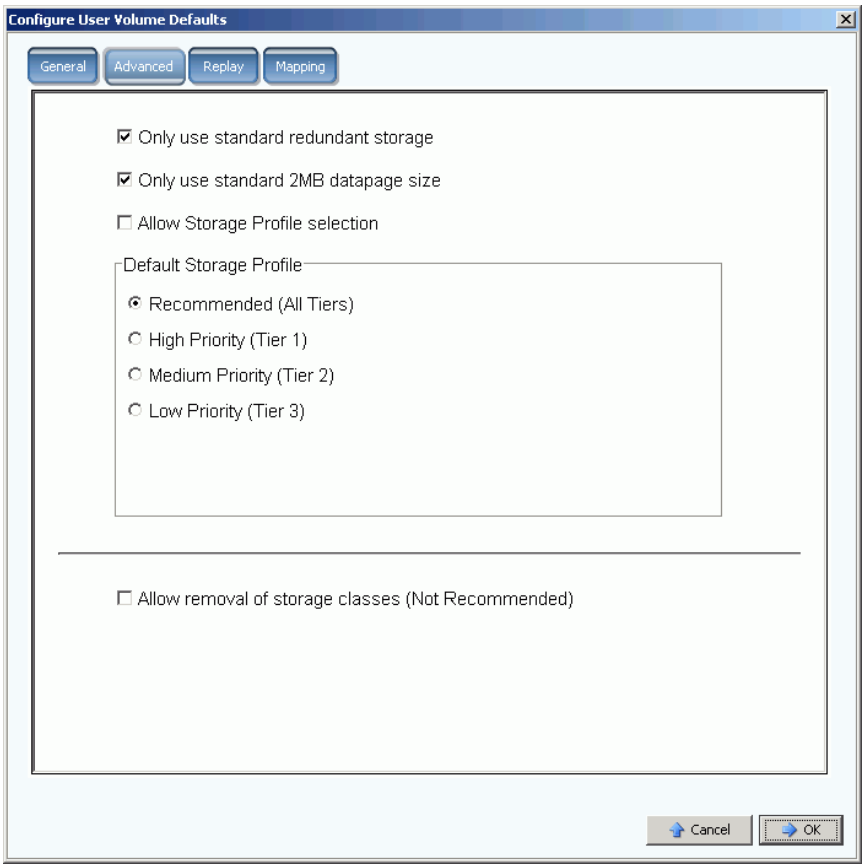


Figure 216. Advanced User Volume Defaults

- For advanced redundancy and datapage sizes, refer to Non-Standard Storage Types on page 138.
- For information on Storage Profiles, refer to Appendix on page 381.
- For information on removing storage classes, refer to Removing a Storage Class on page 121.

Configuring My Volume Defaults - Replay

1 From the Storage Management menu, choose **Volume > Configure My Volume Defaults**.

2 Click the **Replay** tab. The Replay default window appears.

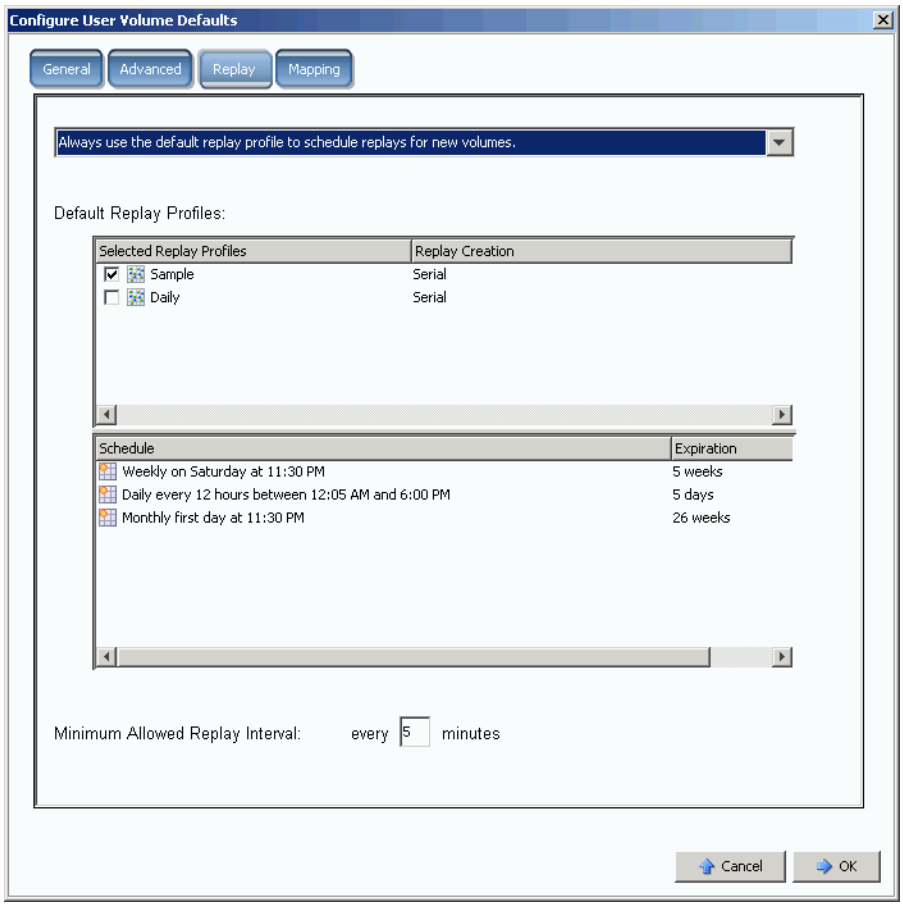


Figure 217. Replay User Volume Defaults

3 Select one of the following:

- Never schedule Replays during volume creation.
- Always prompt for Replay scheduling during volume creation.
- Always use the Default Replay Profile to schedule Replays for new volumes.

4 Select a default **Replay Profile for this User**.

5 Enter or clear a **Minimum Allowed Replay Interval**. This prevents a naive users from overloading the system with Replays.

User Volume Defaults - Mapping

1 From the Storage Management menu, choose **Volume > Configure My Volume Defaults**. The **Configure User Volume Defaults** window appears.

2 Make sure that **Allow User to Modify Preferences** is enabled.

3 Click the **Mapping** tab. The Mapping window appears.

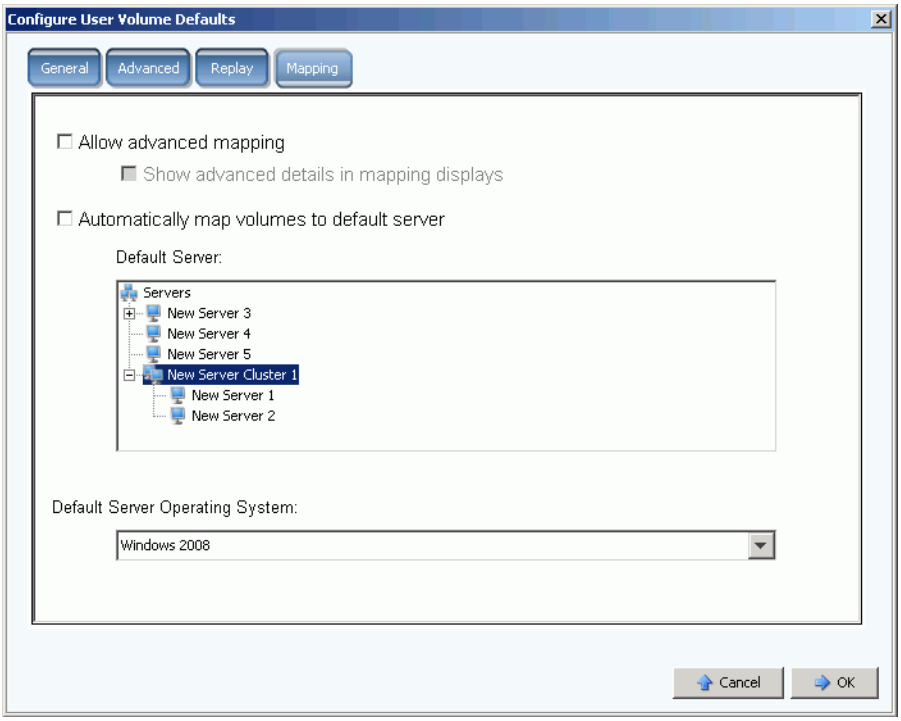


Figure 218. Configure User Volume Mapping Defaults

4 Set these defaults:

- Select or clear **Advanced Mapping**. If you allow advanced mapping, select or clear **Show advance details in mapping displays**. For more information on this option, refer to Viewing Advanced Mapping Details on page 59.
- Check **Automatically map volumes to default server** to speed the Create Volume procedure. If Automatically Map Volume to Default Server is selected, select a server.
- Select a default server operating system.

5 Click **OK**.

Managing User Groups

Administrator users have access to all files folders on the system.

The scope and control of a Volume Manager or Reporter is limited through the use of the user groups to which the user has access. For Volume Managers, User Groups restrict:

- Access and visibility to volumes, servers, and disk folders
- Default values used when a Volume Manager creates a volume

User Groups can give a Volume Manager or Reporter the impression that they are the only users of the Storage Center system; these users can only see the volumes, servers, and disk folders made available to them. Control access to volumes, server, and disks by restricting access to folders.

User groups are restrictive. By adding a user to a user group, you are thereby restricting the user from all other user groups.

User groups to which a user has access appear in the General User window.

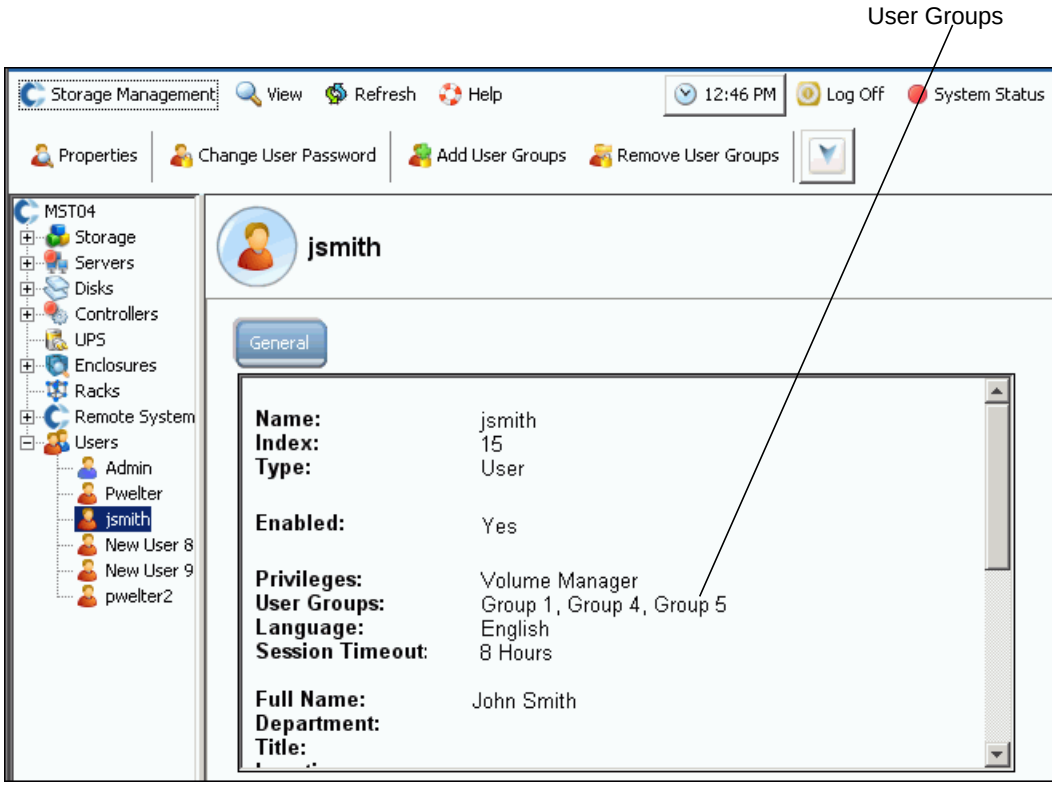


Figure 219. General User Information

Modifying a User Group

1 From the Storage Management menu, choose **User > Manage User Groups**. The

Manage User Groups window appears, displaying current user groups.

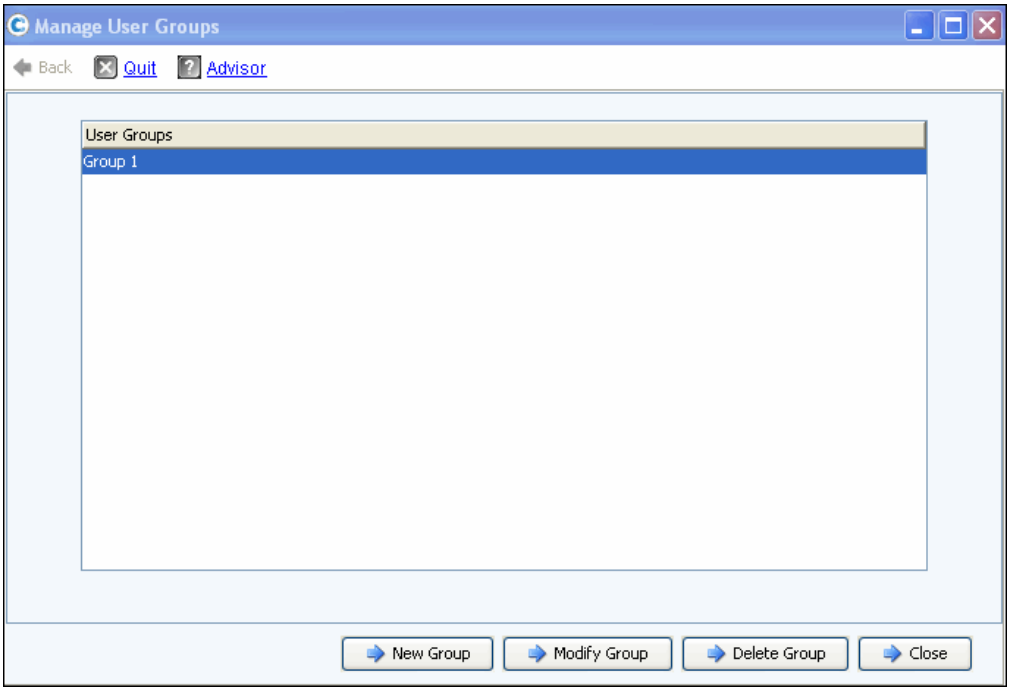


Figure 220. Manage User Groups

2 From the list of current user groups, select a group and choose from the following options:

- **New Group**
- **Modify Group**
- **Delete Group**
- **Close** to cancel out of the action and close the window.

Creating a New User Group

1 In the **Manage User Groups** window, click **New Group**. The **Manage User Groups - Create User Group** window appears.

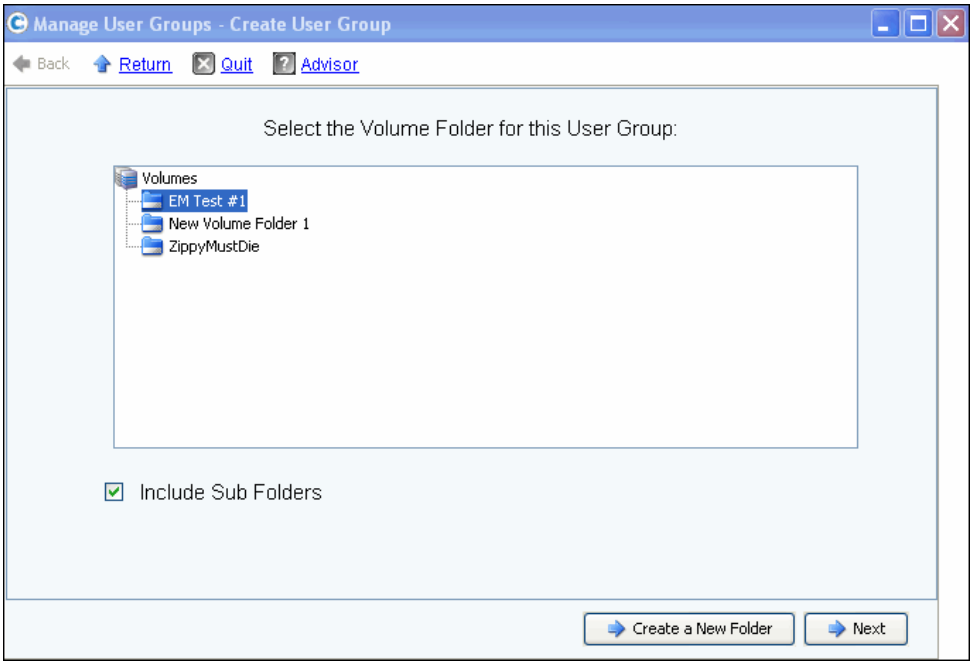


Figure 221. Create User Group

2 From the list of volume folders, select a volume folder to be included in the new user group. Users will be able to access volumes in this folder. If you do not want subfolders to be included, uncheck the **Include Sub Folders** box.

   Optionally, click **Create a New Folder** to create a new folder not listed on this screen. Once the new folder is created, you are returned to this window.

3 Click **Next**. A window allowing you to select a server folder for the user group appears.

4 From the list of server folders, select a server folder to be included in the new user group. Users will be able to access servers in this folder. If you do not want subfolders to be included, uncheck the **Include Sub Folders** box.

   Optionally, click **Create a New Folder** to create a new folder not listed on this screen. Once the new folder is created, you are returned to this window.

5 Click **Next**. A window allowing you to select a disk folder for the user group appears. This folder contains the storage to be used for volumes created by this user group.

6 From the list of disk folders, select a disk folder to be included in the new user group.

7 Click **Next**. A window appears allowing you to name the new user group.

8 Enter a group name and click **Create Now**. You are returned to the original **Manage User Groups** window.

Modifying a User Group

Modifying a user group, adds or removes access to folders and subfolders. Removing a folder from a user group denies access to that folder to users who are members of that group.

Note A user who has access to more than one group may still have access to the folder you removed from this group.

To modify a user group

1 In the **Manage User Groups Update User Group** window, select a user group.

2 Click **Modify Group**. A window appears showing volume, server, and disk folders accessible by the user group

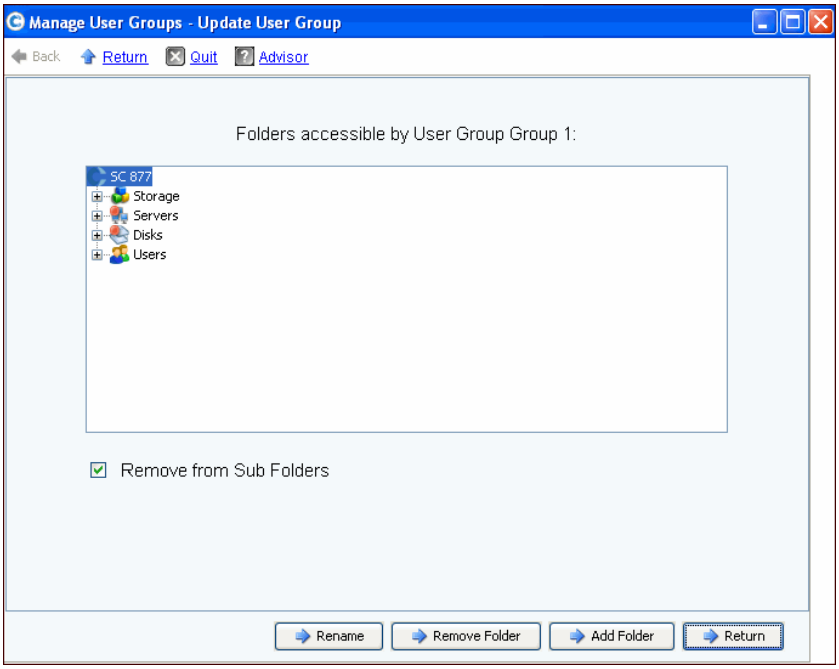


Figure 222. Update User Group

3 From this window, choose from the following:

- **Rename** to rename the user group. See Renaming a User Group on page 280.
- **Remove Folder** to select a folder to be removed. See Removing a Folder from a User Group on page 281
- **Add Folder** to add a volume, server, and disk folder. See Adding a Folder to a User Group on page 281.

4 Or, click **Return** to go to the **Manage User Groups** window.

Renaming a User Group

1 In the **Manage User Groups Update User Group** window, click **Rename**.

2 On the next screen, enter the new name.

3 Click **Rename Now**.

4 Click **Return**.

5 Click **Close.**

Removing a Folder from a User Group

Note Removing a folder from a user group denies access to that folder to users who are members of that group.

1 In the **Manage User Groups Update User Group** window, select a folder or subfolder.

2 Click **Remove Folder**. The wizard displays a window listing user groups that will be impacted by removing the specified folder from the user group.

3 Click **Remove Now**. A removal confirmation window appears asking you to confirm the removal.

4 Click **Yes** to confirm the removal or **No** to cancel.

5 When you have confirmed or cancelled the removal, click **Return**.

6 Click **Close**.

An individual user who has access to more than one group may still have access to the folder you removed from this group.

Adding a Folder to a User Group

Note Adding folders to a user group gives access to users who are a member of that group.

1 In the **Manage User Groups Update User Group** window, click **Add Folder**.

2 On the next window, select one of the following:

- • **Add Volume Folde**r: The System Manager displays a list of volume folders. Select a volume folder. Include or exclude subfolders. Click **Add Now.**
- • **Add Server Folder**: The System Manager displays a list of server folders. Select a server folder. Include or exclude subfolders. Click **Add Now**.
- • **Add Disk Folder**: The System Manager displays a list of disk folders. Select a disk folder. Click **Add Now**.

3 Click **Return**.

4 Click **Close**.

Deleting a User Group

1 On the **Manage User Groups Update User Group** window, select the user group to be deleted.

2 Click **Delete Group**. You are asked to confirm the deletion.

3 Click **Yes** to delete the user group.

4 Click **Close**.

Adding a User to a User Group

You cannot add a user group to an Administrator User because, by definition, the Administrator has access to all folders. User groups are added to existing users to allow access to folders contained in that user group. To add a user group:

1. From the Storage Management menu, choose **User > Add User Groups**. The Add User Groups window appears, displaying current users.
2. Select a **User**. Click **Continue**.
3. The **Add User Group to User** window appears.
4. Select a **User Group** to add to this user.
5. Click **Add Now**. The user is added to the group and the window closes.

Removing a User from a User Group

1. From the Storage Management menu, choose **User > Remove User Groups**. The **Select the User to Remove** window appears, displaying current users.
2. Select a **User** to remove from the user group.
3. Click **Continue**. The **Remove User Groups** window appears with a list of groups for the user.
4. Select a **User Group** from which to remove the user.
5. Click **Continue**. You are asked to confirm the deletion. If you confirm, the user is removed from the **User Group** and the window closes.

9 Data Instant Replay

Introduction 284
Viewing Replay Profiles 285
Applying Replay Profiles to Volumes 288
Viewing Volumes Attached to a Replay Profile 290
Creating Replay Profiles 292
Adding Replay Profile Rules 300
Managing Replay Profiles 305
Recovering Data 321

Introduction

Data Instant Replay is a separately licensed Storage Center application.

A Replay is a point-in-time copy of one or more volumes. Once an initial Replay of a volume is taken, subsequent Replays preserve pointers to data that has changed since the previous Replay. This minimizes the amount of storage space required to preserve periodic copies of a volume.

Replay Profiles are a collection of rules describing when to take periodic Replays for one or more volumes and how long before Replays are deleted (expired). A Replay Profile can contain multiple rules. For example, a Replay Profile can require a Replay to be taken once a day and once a week and once a month. More than one Replay Profile can be applied to one or more volumes. Once a Replay Profile is applied to volumes, subsequent changes to the Replay Profile are applied to all the volumes to which the Replay Profile is attached.

- Changes to the rules for taking a Replay only affect Replays taken in the future.
- Changes to the rules for expiring Replays go into effect immediately for all Replays created by the Replay Profile.

Viewing Replay Profiles

Viewing a List of Replay Profiles

1 From the system tree, select **Storage > Replay Profiles**. A list of Replay Profiles appears.

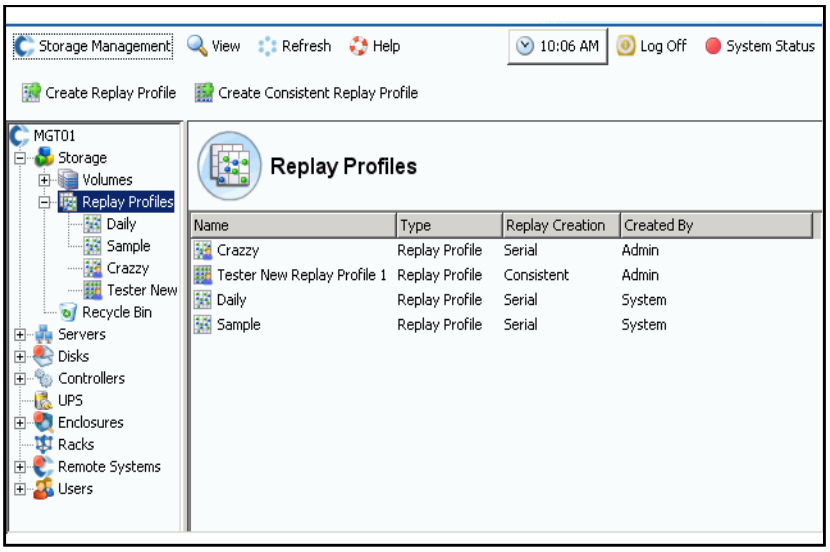


Figure 223. List of Replay Profiles

The list shows:

- **Name**: of the Replay Profile
  - Daily and Sample are default profiles created by the system. Profiles created by the system cannot be modified or deleted.
- **Type**: Subject of this window
- **Replay Creation:** Serial, Parallel, or Consistent
- **Created by**:
  - System creates two default Replay Profiles, Daily and Sample
  - Root User creates Replay Profiles by converting Replay Templates that were in use in Storage Center 4.0 or before. If you do not have Replay Templates created in a prior version of Storage Center, you will not have Replay Profiles create by the Root User.
  - Name of user who created the Replay Profile.

Note A Volume Manager can create Replay Profiles, but cannot delete them. In general, the rules given in the this chapter are for users with Administrative privileges.

Viewing General Replay Profile Information

To view General Replay Profile, from the system tree, select **Storage > Replay Profiles**.

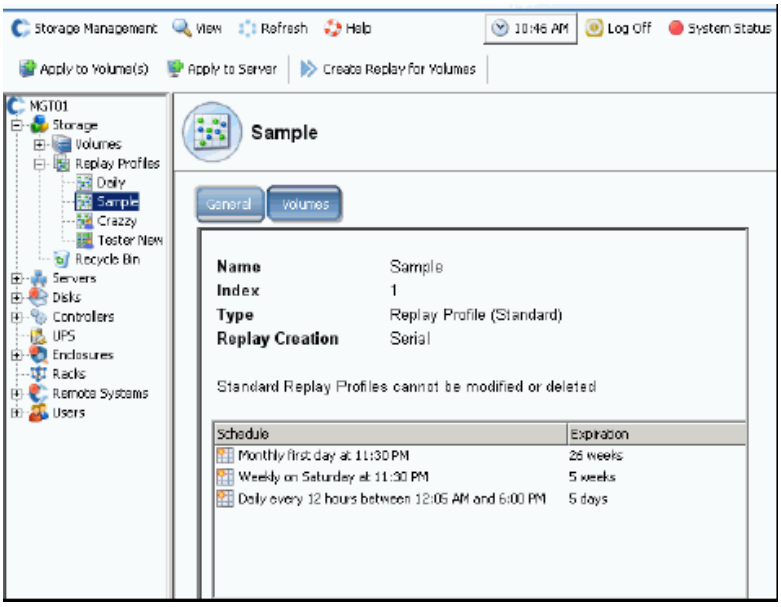


Figure 224. Standard Sample Replay Profile

The Sample Replay Profile is standard, and part of every Storage Center system. It cannot be modified or deleted. General Information includes:

- **Name**: The name of the Profile is whatever the creator names it except for the two system-created Standard Profiles.
- **Index**: Number for the object required by Dell Support Services.
- **Type**: A Replay Profile can be on of the following:
  - **Standard**: Created by the system
  - **Custom**: Created by a user
- **Replay Creation**: A Replay applied to more than one volume can be one of the following:
  - **Serial**: Takes a Replay one volume at a time.
  - **Parallel**: Creates a Replay of all volumes simultaneously.
  - **Consistent**: Halts IO to all volumes to which the Replay Profile is attached until Replays are taken for each volume.
- **Schedule**: Specifies when Replays will be taken
- **Expiration**: How long the Replay will be saved. Replays can also be manually expired. Refer to Expiring a Replay Explicitly on page 312.

Viewing Volumes to Which a Replay Profile is Applied

1 \From the system tree, select **Storage > Replay Profiles**.

2 Click the **Volumes** tab. A list of Volumes appears.

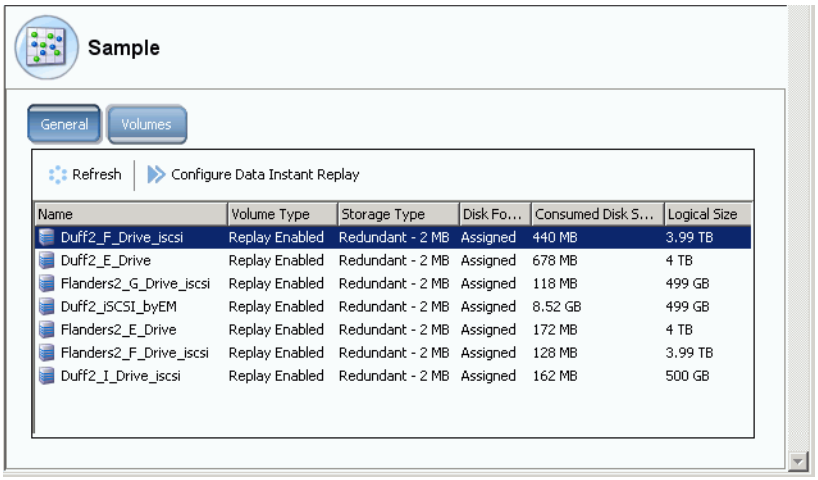


Figure 225. Volumes to which Replay Profile is Attached

Applying Replay Profiles to Volumes

Because all Storage Center systems come with two common default Replay Profiles, Daily and Sample, you are not required to create any custom Replay Profiles. To create a custom Replay Profile, refer to Creating Replay Profiles on page 292.

Standard Default Daily Replay Profile

The rules for the Standard Default Daily Replay Profile are as follows:

- The standard default Daily Replay Profile takes a Replay once a day at one minute past midnight (12:01 AM) of all volumes to which the Replay Profile is attached.
- Each Replay will automatically expire in one week.

Standard Default Sample Replay Profile

The standard default Sample Replay Profile takes three Replays for all volumes to which the Replay Profile is attached. The rules for the Standard Default Sample Replay Profile are as follows:

- A Replay is taken twice every day (weekends included). The first Replay is taken at 5 minutes after midnight (12:05 AM). The second daily Replay is taken 12 hours later, but not between the four hours of 6:00 PM and 12:05 AM. Each Replay is automatically expired 5 days later.
- In addition to the twice-daily Replays, the Sample Replay Profile instructs Storage Center to take a Replay once a week on Saturday at 11:30 PM. The weekly Replay is automatically expired after 5 weeks.
- In addition to the twice-daily and weekly Replays, the Sample Replay Profile instructs Storage Center to take a Replay once a month on the first day of the month (for example, January 1, February 1, and so forth). The monthly Replay is automatically expired after 26 weeks.

Applying an Existing Replay Profile to One or More Volumes

1. From the system tree, select **Storage > Replay Profiles**.
2. From the shortcut menu, select **Apply to Volumes**. The Apply Replay Profile window appears, listing volumes. Expand volume folders, if necessary.

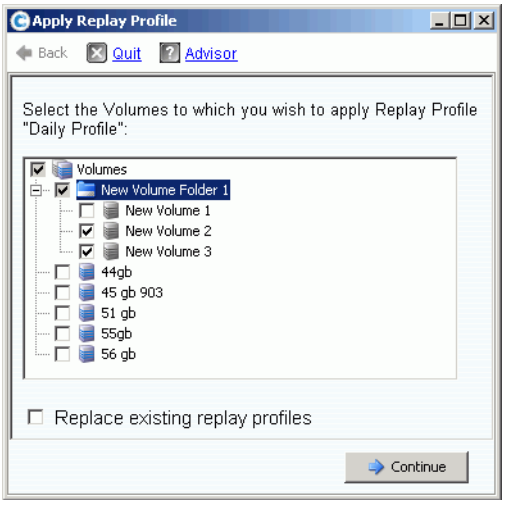


Figure 226. Apply Replay Profiles

3 Select volumes to which to apply the profile.

4 Select or clear **Replace Existing Replay Profiles**. Remember, multiple Replay Profiles can be applied to a volume.

5 Click **Continue**. The Apply Profile Confirmation window appears.

6 Click **Apply Now**.

Note Subsequent changes to the Replay Profile will be applied to all volumes using the Replay Profile. Changes to the rules for taking a Replay only affect Replays taken in the future. Changes to the rules for expiring Replays go into effect immediately for all Replays created by the profile.

Viewing Volumes Attached to a Replay Profile

1 In the system tree, select a **Replay Profile**.

2 In the Profile window, click the **Volumes** tab. The System Manager displays all volumes attached to the profile.

Changing Profiles Attached to Selected Volumes

1 Holding down the **Shift** or **Ctrl** key, select one or more volumes.

2 From the shortcut menu, select **Replay > Configure Data Instant Replay**.

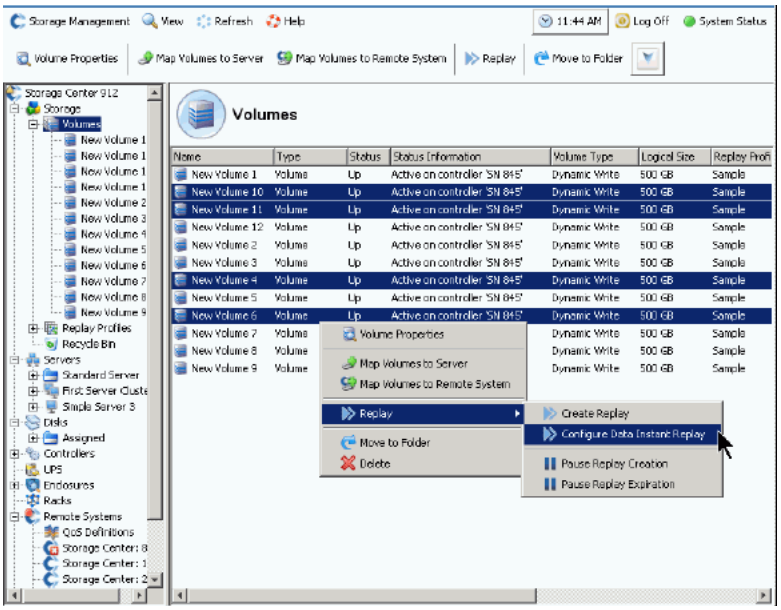


Figure 227. Configure Profiles for Selected Volumes

The System Manager displays all Replay Profiles.

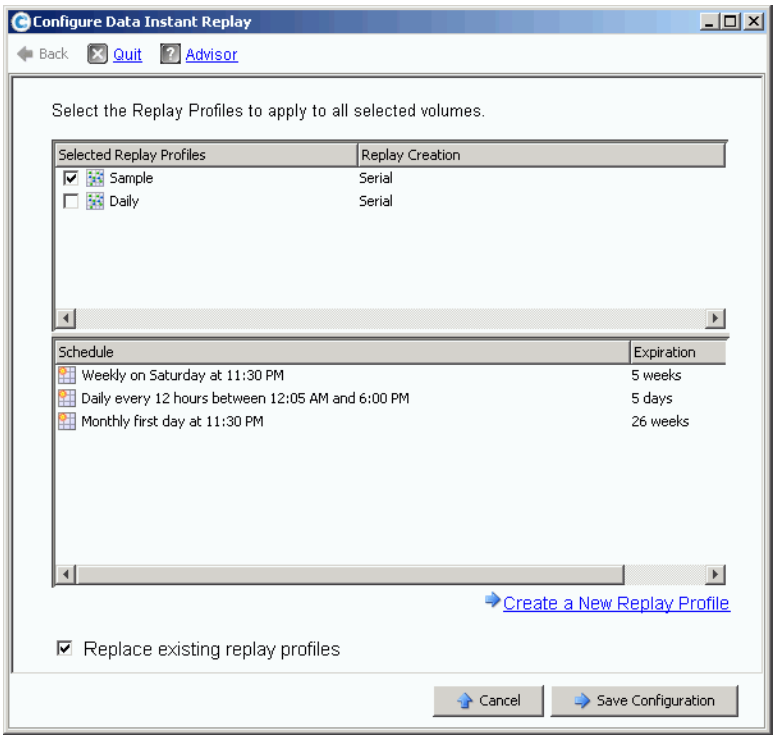


Figure 228. Configure Replays for Selected Volumes

3 Choose profiles to attach to the selected volumes. A cumulative list of Replay schedules for all selected profiles appears in the bottom frame.

4 Select or clear **Replace Existing Replay Profiles**.

5 Click **Save Configuration** to apply Profiles to the volumes or click **Create a New Replay Profile**. (Refer to Creating Replay Profiles on page 292).

Creating Replay Profiles

Non-Consistent and Consistent Replays

A Consistent Replay Profile halts IO to all volumes to which the Replay Profile is attached until Replays are taken for each volume.

Consistent Replay Profile	Non-Consistent Replay Profile
Halts IO across all volumes as a group	Halts I/O for each volume independently of other volumes.
Resource intensive	Less resource intensive - depends on the amount of data written since the previous Replay
Limited to 40 volumes	No limit to the number of volumes to which the Replay Profile is attached
Replays are taken of all volumes simultaneously	Choose between Serial (one volume at a time) or Parallel (all volumes simultaneously)
Can set an Alert if Replays cannot be completed within a defined time. Replays not completed before alert is generated are not taken. (This can lead to incomplete groups of Replays across volumes.)	All Replays are taken
Can delete incomplete group of Replays	All Replays are taken
Can be converted to Non-Consistent Replay Profile	Can be converted to Consistent Replay Profile

Creating a Non-Consistent Replay Profile

1 From the system tree, select **Storage > Replay Profiles**.

2 From the shortcut menu, select **Create Replay Profile**. The **Create Replay Profile** window appears.

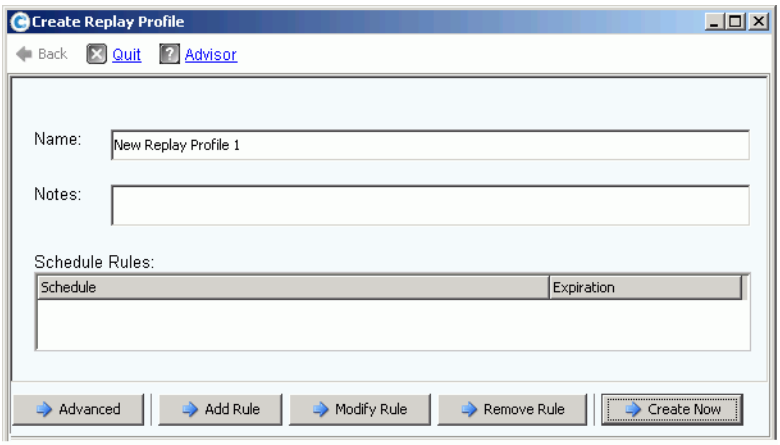


Figure 229. Create Replay Profile

3 Enter a Replay Profile name or accept the default. Enter any notes (up to 255 characters).

4 Click **Add Rule**. A window appears allowing you to set rules for the Replay Profile.

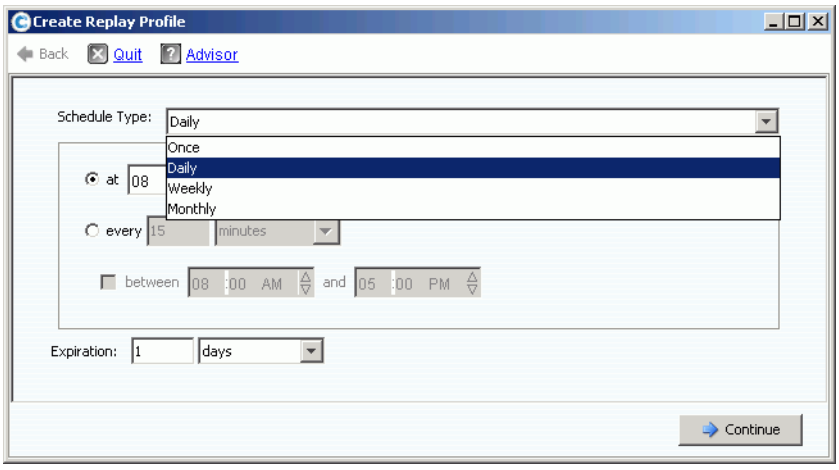


Figure 230. Replay Profile Schedule Type

5 Select a time Replays will be taken and when they will expire. Replay Profile Rules are described more fully in Adding Replay Profile Rules on page 300.

6 Click **Continue**. The **Create Replay Profile** window shown in Figure 229 reappears. Continue adding rules.

- To modify a rule, select the rule in the **Create Replay Profile** window and click **Modify Rule**.
- To delete a rule, select the rule in the **Create Replay Profile** window and click **Remove Rule**.
- If the Replay Profile is to be attached to more than one volume, by default Storage Center takes Replays serially, one volume at a time. To take Replays of all volumes simultaneously, click **Advanced**. For more information, refer to Taking Simultaneous Replay Profiles on page 294.

7 When you have finished configuring the Replay Profile, click **Create Now**. The Replay Profile is created.

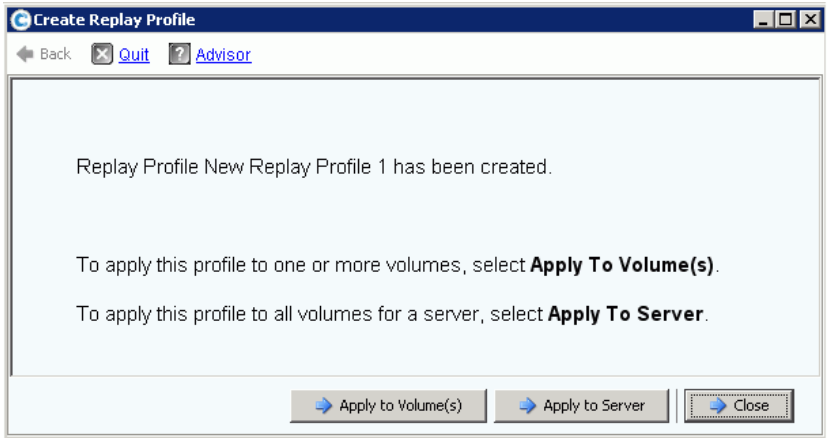

Create Replay Profile
Back
Quit
Advisor
Replay Profile New Replay Profile 1 has been created.
To apply this profile to one or more volumes, select Apply To Volume(s).
To apply this profile to all volumes for a server, select Apply To Server.
Apply to Volume(s)
Apply to Server
Close

Figure 231. Apply Standard Profile to Volumes or Severs

8 When you are finished configuring a standard Replay Profile, continue with Applying a Replay Profile on page 294.

Taking Simultaneous Replay Profiles

Note Because Parallel Replays are more resource-intensive than Serial Replays, Parallel Replay Profiles are not recommended.

1 In the **Create Replay Profile** window shown in Figure 229 on page 292, click **Advanced**. The following window appears.

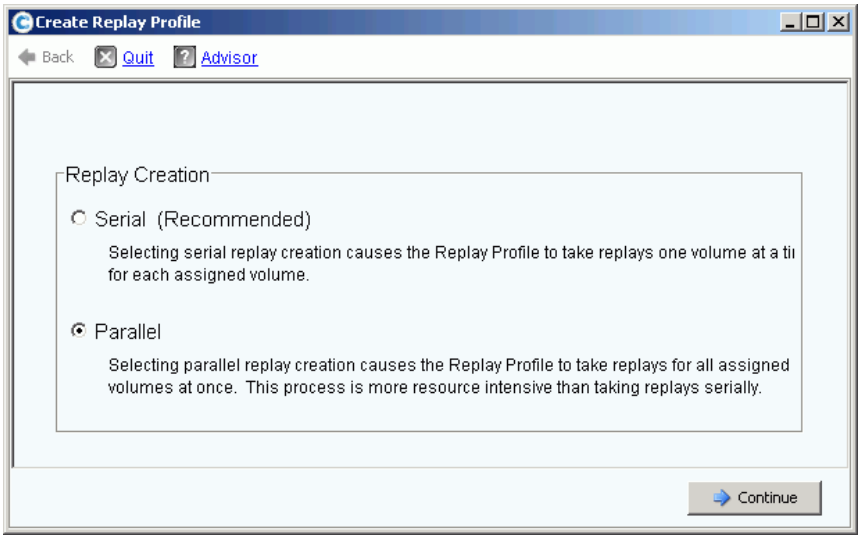

Create Replay Profile
Back
Quit
Advisor
Replay Creation
Serial (Recommended)
Selecting serial replay creation causes the Replay Profile to take replays one volume at a ti
for each assigned volume.
Parallel
Selecting parallel replay creation causes the Replay Profile to take replays for all assigned
volumes at once. This process is more resource intensive than taking replays serially.
Continue

Figure 232. Replay Creation Window

2 Select **Parallel**. Selecting **Parallel** enables the Replay Profile to take a Replay for all the volumes to which the Profile is attached at one time.

3 Click **Continue**. Storage Center returns to the window shown in Figure 229.

4 When you are finished configuring a Standard Replay Profile, continue with Applying a Replay Profile on page 294.

Applying a Replay Profile

You can apply a Replay Profile to one or more volumes or to all volumes for a server.

To apply a Replay Profile to one or more volumes

1 In the window shown in Figure 231 on page 293, select **Apply to Volume(s)**. A list of volumes and volume folders appears.

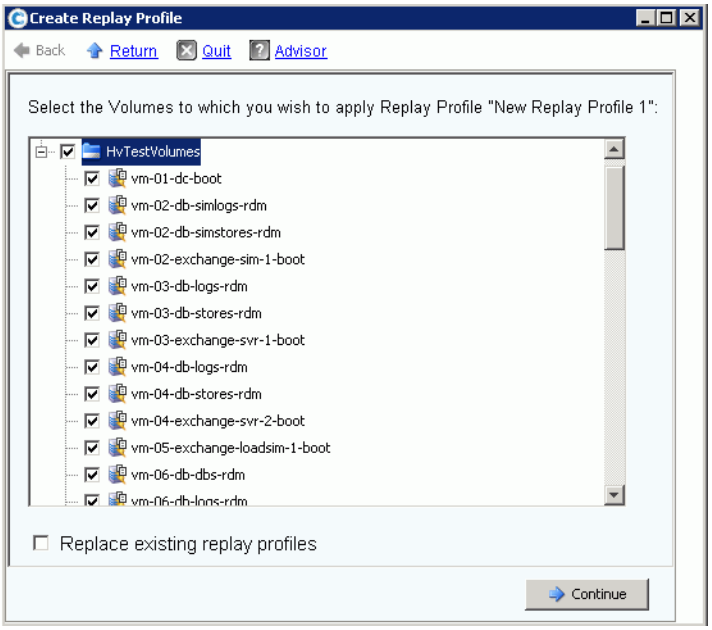


Figure 233. Apply Standard Profile to Volume or Volume Folders

2 Select individual volumes to which to apply the Replay Profile. To apply the Replay Profile to all files in a folder, select the folder.

3 Choose to replace exiting Replay Profiles or not.

4 Click **Apply Now**. The Replay Profile is attached to the volumes displayed.

To apply a Replay Profile to all volumes mapped to a server or server cluster

1 In the window shown in Figure 231 on page 293, select **Apply to Servers**. A list of servers and Server Clusters appears.

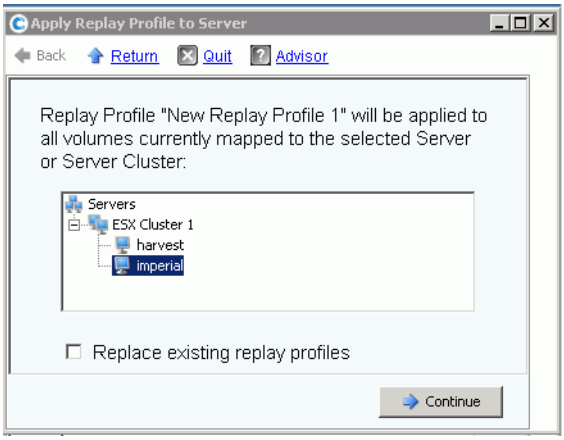


Figure 234. Apply Replay Profile to Servers

2 Select a server or a Server Cluster to which to apply the Replay Profile.

3 Choose to replace exiting Replay Profiles or not. Click **Continue**. The system displays the volumes to which the Replay Profile will be attached.

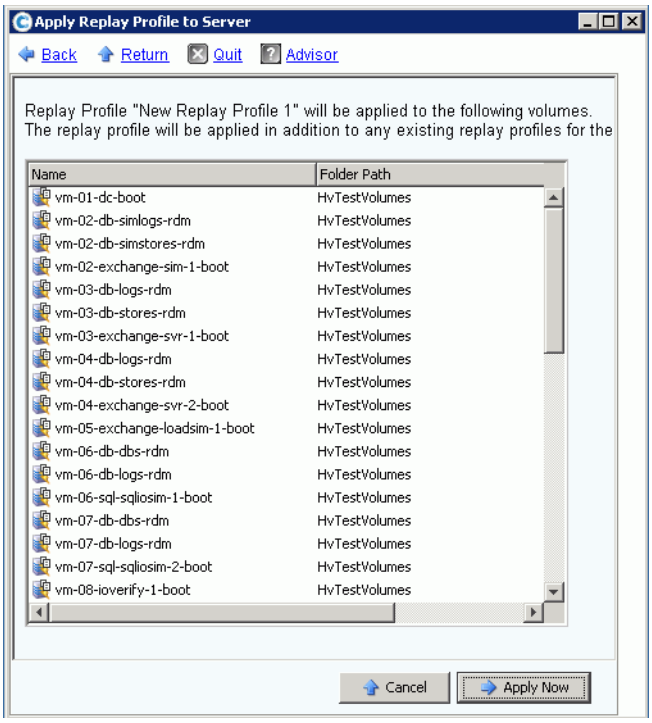


Figure 235. List of Volumes Mapped to Server

4 Click **Apply Now**. The Replay Profile is attached to the volumes displayed.

Creating a Consistent Replay Profile

Consistent Replay Profiles maintain a consistent set of Replay data across multiple volumes. To ensure consistency, volume IO is halted for all volumes to which the Replay Profile is attached.

To create a consistent Replay profile

1 From the system tree, select **Storage > Replay Profiles**.

2 From the shortcut menu, select **Create Consistent Replay Profile**. The **Create Consistent Replay Profile** window appears, warning you that Consistent Replay Profiles can cause IO time outs.

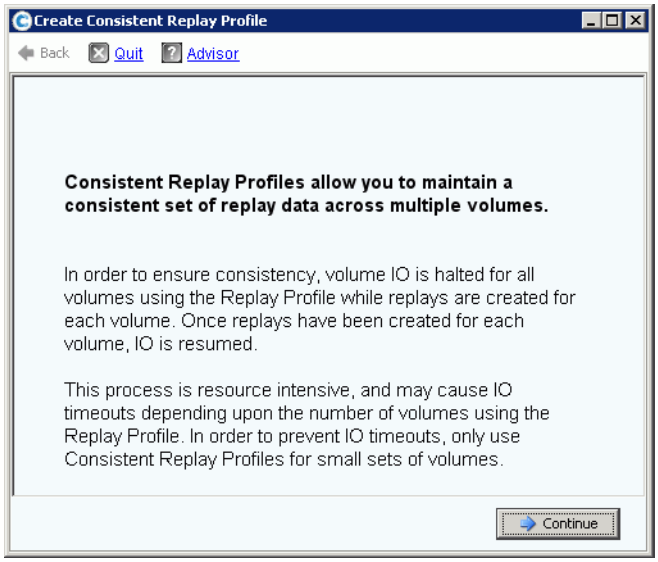

Create Consistent Replay Profile
Back
Quit
Advisor
Consistent Replay Profiles allow you to maintain a consistent set of replay data across multiple volumes.
In order to ensure consistency, volume IO is halted for all volumes using the Replay Profile while replays are created for each volume. Once replays have been created for each volume, IO is resumed.
This process is resource intensive, and may cause IO timeouts depending upon the number of volumes using the Replay Profile. In order to prevent IO timeouts, only use Consistent Replay Profiles for small sets of volumes.
Continue

Figure 236. Consistent Replay Profile Description

3 Click **Continue**. The **Create Consistent Replay Profile** window appears.

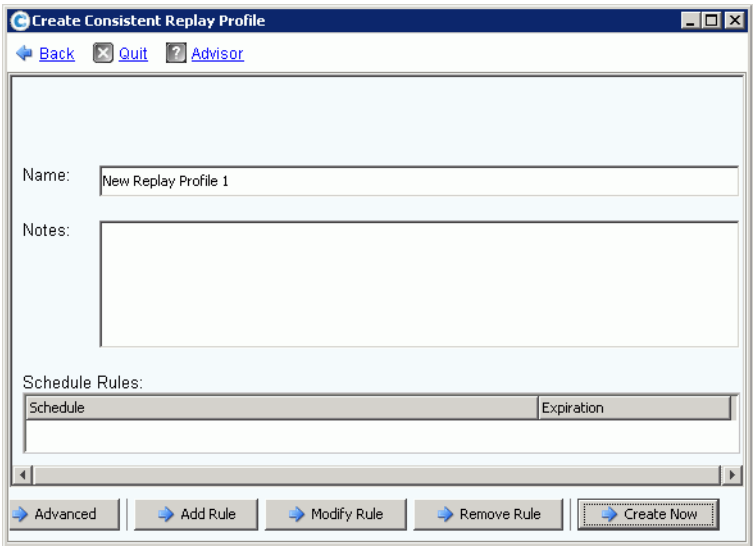


Figure 237. Create Consistent Replay Profile Window

4 Enter a Replay Profile name or accept the default. Enter any notes (up to 255 characters).

5 Click **Add Rule**. The window that allows you to add a rule appears as shown in Figure 239 on page 300. Select a time Replays will be taken and when they will expire. Replay Profile Rules are described more fully in Adding Replay Profile Rules on page 300.

6 Click **Continue**. The **Create Replay Profile** window reappears. Continue adding rules.

- To modify a rule, select the rule in the Create Replay Profile window and click **Modify Rule**.
- To delete a rule, select the rule in the Create Replay Profile window and click **Remove Rule**.

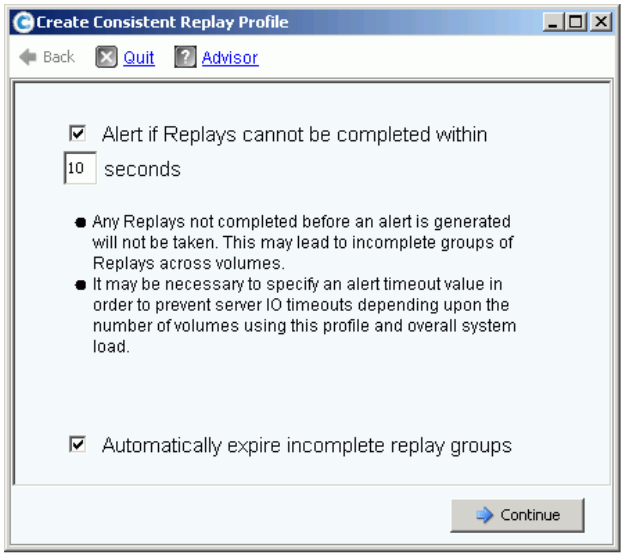

Create Consistent Replay Profile
Back
Quit
Advisor
Alert if Replays cannot be completed within
10
seconds
Any Replays not completed before an alert is generated will not be taken. This may lead to incomplete groups of Replays across volumes.
It may be necessary to specify an alert timeout value in order to prevent server IO timeouts depending upon the number of volumes using this profile and overall system load.
Automatically expire incomplete replay groups
Continue

Figure 238. Set Consistent Replay Alert

Note A Consistent Replay halts IO for all volumes to which it is attached. If the amount of data copied through the Replay is large enough to cause a server time out, set an Alert.

Any Replays not completed before an Alert is generated will not be taken. This can lead to incomplete groups of Replays across volumes. Depending upon the number of volumes using the profile and overall system load, it may be necessary to specify an alert time-out value to prevent server IO time-outs.

7 Check **Alert if Replays Cannot Be Completed**. Enter a time in seconds to avoid a server time out, 59 seconds or less. Do not enter a time greater than 59 seconds.

8 Select or clear **Automatically Expire Incomplete Replay Groups**.

9 Click **Continue**. A window allowing you to apply a Profile to volumes or servers appears.

- To apply the Consistent Replay Profile to volumes or volume folders, click **Apply to Volumes**.
- To apply the Consistent Replay Profile to all volumes on a server or server cluster, click **Apply to Servers**.

10 When you are through configuring the Replay Profile, click **Create Now**.

Adding Replay Profile Rules

1 Click **Add Rule**. A window allowing you to enter a **Schedule Type** appears.

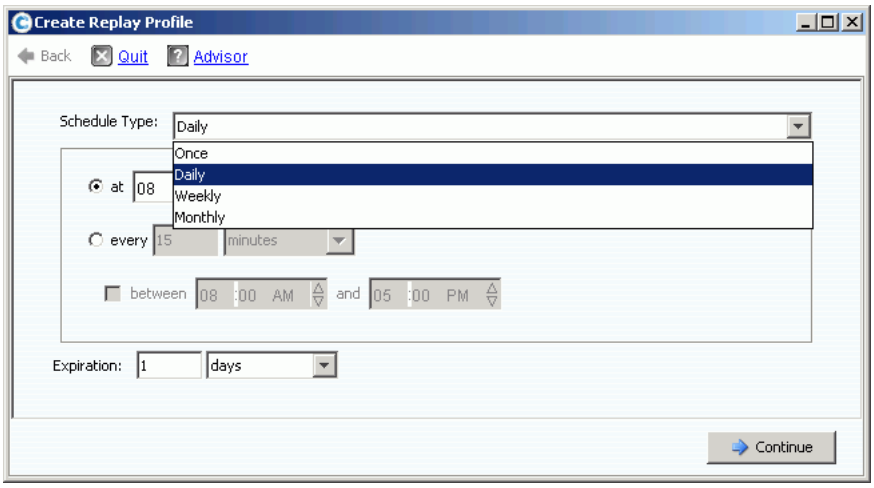


Figure 239. Replay Profile Schedule Type

2 From the **Schedule Type** list, select a **Schedule Type**:

- Once
- Daily
- Weekly
- Monthly

Once

a In the **Schedule Type** list, choose **Once** for a one-time Replay Profile.

b Enter a start date and time when the Replay will be taken. Click the down arrow to view a calendar.

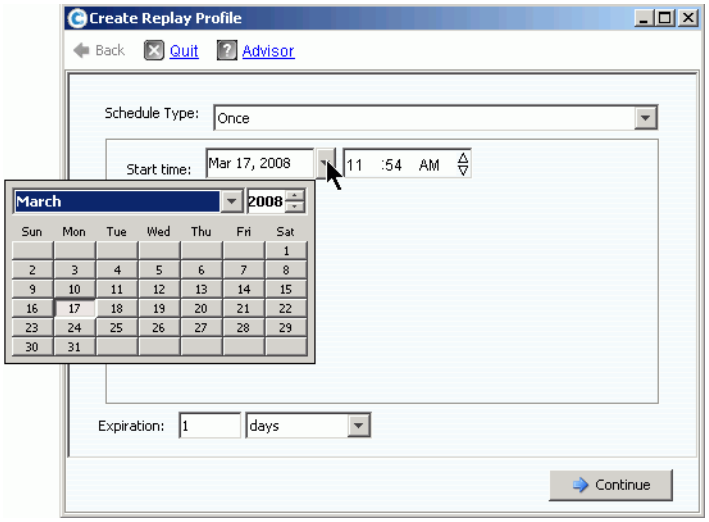


Figure 240. Select Start Date

c Enter a time period in minutes, hours, days, or weeks after which Replays will expire.

d Click **Continue**. The wizard displays the schedule and expiration for the rule.

e Enter a name or accept the default. Enter any notes (up to 255 characters).

f Finish or modify the Profile.

- To create the Profile, click **Create Now**. The Replay Profile appears in the list of Profiles.
- To add a rule to the Profile, click **Add Rule**. The **Schedule Type** window reappears. Add another rule.
- To modify the current rule, click **Modify Rule**. The **Schedule Once** window reappears.
- To delete the rule, click **Delete Rule**. The rule is deleted.

Daily

1 In the **Schedule Type** list, select **Daily** for a daily Replay Profile.

2 Choose a time for a Daily Replay Profile: either once a day or at a chosen time.

Once a Day

1 Click in the **Hour** or **Minute** field. Select the up or down arrows to scroll to the hour and minute when the Replay will be taken.

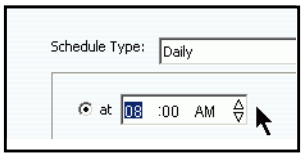


Figure 241. Select Hour and Minute

2 Click in the **AM/PM** field. Click the up or down arrows to select **AM** or **PM**.

Selected Daily Time Period

1 Enter a time interval in hours or minutes.

2 To restrict daily Replay Profiles, select the hours between which the Replay is taken.:

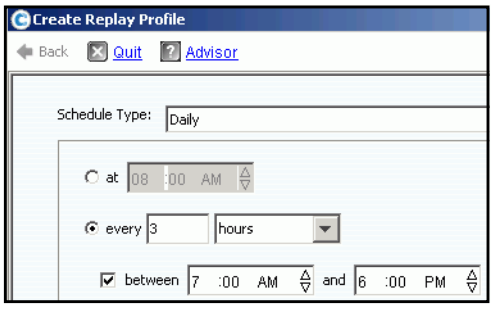


Figure 242. Select Time Interval

a Enter an expiration interval in minutes, hours, days, or weeks after which Replays will expire.

b Click **Continue**.

c Enter a name or accept the default. Enter any notes (up to 255 characters).

d Finish or modify the Profile.

- To create the Profile, click **Create Now**. The Replay Profile appears in the list of Profiles.
- To add a rule to the Profile, click **Add Rule**. The Schedule Type window reappears. Add another rule.
- To modify the current rule, click **Modify Rule**. The Schedule Daily window reappears.
- To delete the rule, click **Delete Rule**. The rule is deleted.

Weekly

1 In the **Schedule Type** list, choose **Weekly**.

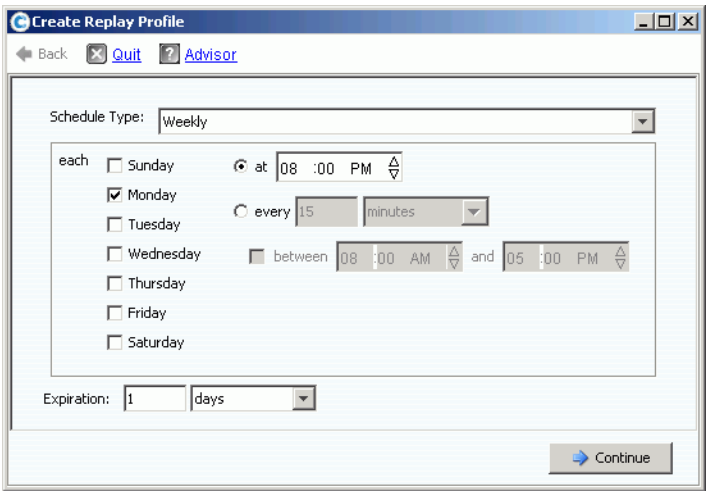


Figure 243. Weekly Schedule Type

2 Select one or more days of the week.

3 Either choose a time each day for a Replay, or an interval. If you choose an interval, you can limit the number of Replays by choosing the hours during which Replays will be taken.

4 Chose an expiration interval in minutes, hours, days, or weeks after which the Replays expire.

5 Click **Continue**. The wizard displays the schedule and expiration for the rule.

6 Finish or modify the Profile.

- To create the Profile, click **Create Now**. The Replay Profile appears in the list of Profiles.
- To add a rule to the Profile, click **Add Rule**. The Schedule Type window reappears. Add another rule.
- To modify the current rule, click **Modify Rule**. Schedule Weekly window reappears.

- To delete the rule, click **Delete Rule**. The rule is deleted.

Monthly

In the **Schedule Type** list, choose **Monthly**.

Monthly Per Day

1 Click the red **Days** tab.

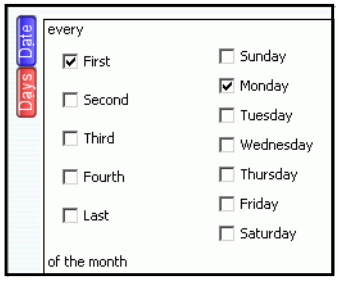


Figure 244. Select Day

2 Select one or more days of the week to schedule the Replay.

3 Select one or more weeks of the month to schedule the Replay.

Monthly per Date

1 Click the blue **Date** tab.

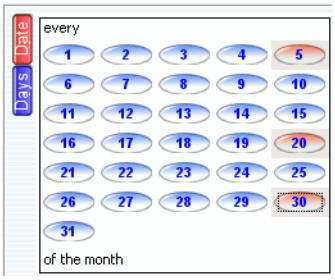


Figure 245. Select Date

2 Select one or more dates to schedule Replays.

3 Either choose a time each day for a Replay, or an interval. If you choose an interval, you can limit the number of Replays by choosing the hours during which Replays will be taken.

To limit the months during which Replays are taken

1 Click **Select Months**. Click one or more months.

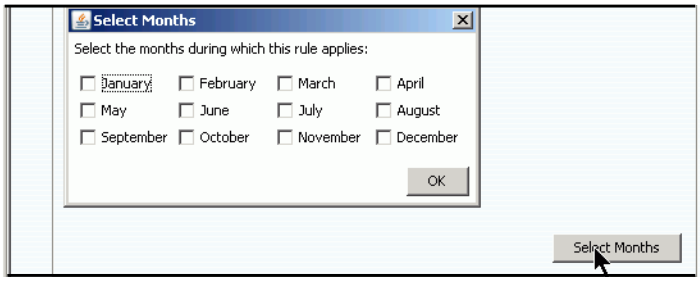


Figure 246. Select Months

2 **Chose** an expiration interval after which the Replay will be deleted.

3 Click **OK**.

4 Click **Add New Rule**. The wizard displays the schedule and lifetime for the Replay.

To finish or modify the monthly schedule

1 To create the Profile, click **Create Now**. The Replay Profile appears in the list of Profiles.

2 To add a rule to the Profile, click **Add Rule**. The Schedule Type window reappears. Add another rule.

3 To modify the current rule, click **Modify Rule**. The Schedule Monthly window reappears.

4 To delete the rule, click **Delete Rule**. The rule is deleted.

Configuring Replay Profile Volume Defaults

Replay Profile Volume Defaults are set for each user. Refer to Configuring My Volume Defaults - Replay on page 274.

Managing Replay Profiles

To view...	Do the following ...
Replay Profiles	From the system tree, expand the Storage node.
List of Replay Profiles	From the system tree, expand the Storage node. Expand the Replay Profiles node.
Default standard Replay Profiles created by system: Daily and Sample	From the system tree, expand the Storage node. Expand the Replay Profiles node. Click on a Standard Replay Profile
Custom Replay Profiles created by users	From the system tree, expand the Storage node. Expand the Replay Profiles node. Click on a Custom Replay Profile.
Consistent Replay Profile	From the system tree, expand the Storage node. Expand the Replay Profiles node. Click on a Consistent Replay Profile.
Volumes to which Replays are attached	From the system tree, expand Storage / Replay Profiles. Select a Replay Profile. Click the Volumes tab.

Modifying a Replay Profile

Modifying a Replay Profile affects all volumes attached to the Replay Profile. Replays that have already been taken are not affected. Replays that are scheduled to be taken via the rules in the Replay Profile are affected. Replays that have not yet expired are affected if the expiration rule is changed.

Adding Rules to a Replay Profile

1 Select a Replay Profile.

2 From the shortcut menu, select **Modify**. The **Modify Replay Profile** window appears.

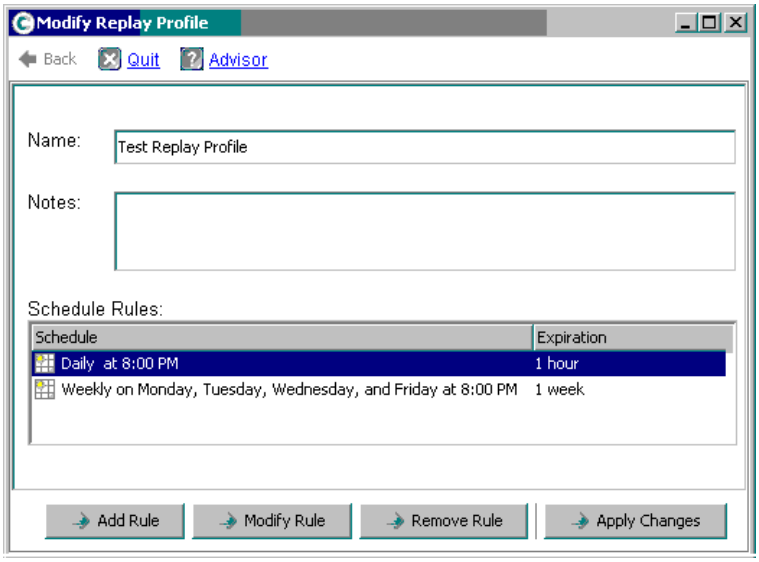


Figure 247. Modify Replay Profile.

3 Click **Add Rule**. The **Schedule Type** window appears.

4 Choose a **Schedule Type**.

5 Follow the steps described in Creating Replay Profiles on page 292.

6 Click **Continue**. The **Modify Replay Profile** window reappears.

7 Click **Apply Changes**. The Rule is added to the Replay Profile. The Replay Profile is modified. The new rule appears in the Replay Profile window.

Modifying a Rule

1 Select a Replay Profile. From the shortcut menu, select **Modify**. The **Modify Replay Profile** window appears.

2 Select a **Rule** in the Replay Profile.

3 Click **Modify Rule**.

4 The **Schedule Type** appears.

5 Choose the same or a new Schedule Type.

6 Follow the steps described in Creating Replay Profiles on page 292.

7 When the Rule is modified, click **Continue**. The **Modify Replay Profile** window reappears.

8 Click **Apply Changes**. The Replay Profile is modified. The changed rule appears in the Replay Profile window.

Removing a Rule from a Replay Profile

1 Select a Replay Profile. From the shortcut menu, select **Modify**. The **Modify Replay Profile** window appears, as shown in Figure 247 on page 306.

2 Select a **Rule** in the Replay Profile.

3 Click **Remove Rule**. The Rule no longer appears in the Schedule Rules of the Replay Profile.

4 Click **Apply Changes**. The System Manager removes the rule.

5 The Replay Profile window reappears, showing that the Rule is deleted.

Renaming a Replay Profile

Note Renaming a Replay Profile does not change rules in a profile.

1 Select a Replay Profile. From the shortcut menu, select **Modify**. The **Modify Replay Profile** window appears.

2 In the **Name** field, enter a new name.

3 Click **Apply Changes**. The Replay Profile window reappears, showing the new Replay Profile name.

Changing a Non-Consistent Replay Profile to a Consistent Replay Profile

1 In the system tree, select the **Replay Profile** to change.

2 From the Shortcut menu, select **Convert to Consistent Replay Profile**. The system describes Consistent Replay Profiles, similar to Figure 236 on page 297.

3 Click **Continue**. The Replay Profile is changed from Non-Consistent to Consistent.

Changing a Consistent Replay Profile to a Non-Consistent Replay Profile

1 In the system tree, select the **Replay Profile** to change.

2 From the Shortcut menu, select **Convert to Non-Consistent Replay Profile**. The system describes Consistent Replay Profiles, similar to Figure 236 on page 297.

3 Click **Continue**. The Replay Profile is changed from **Consistent** to **Non-Consistent.**

Deleting a Replay Profile

Note You cannot delete a Replay Profile that is created by the System or currently in use by volumes.

1 In the system tree, select **Storage > Replay Profiles folder**.

2 Select a **Replay Profile**. From the shortcut menu, select **Delete**.

3 The System Manager asks you to confirm.

4 Click **Yes**. The profile is deleted.

Detaching Volumes from a Replay Profile

Note You cannot detach a Replay Profile to which volumes are attached.

1 In the system tree, select **Storage > Replay Profiles folder**.

2 Select a **Replay Profile**.

3 In the Replay Profile window, click **Volumes**. A list of volumes to which the Replay Profile is attached appears.

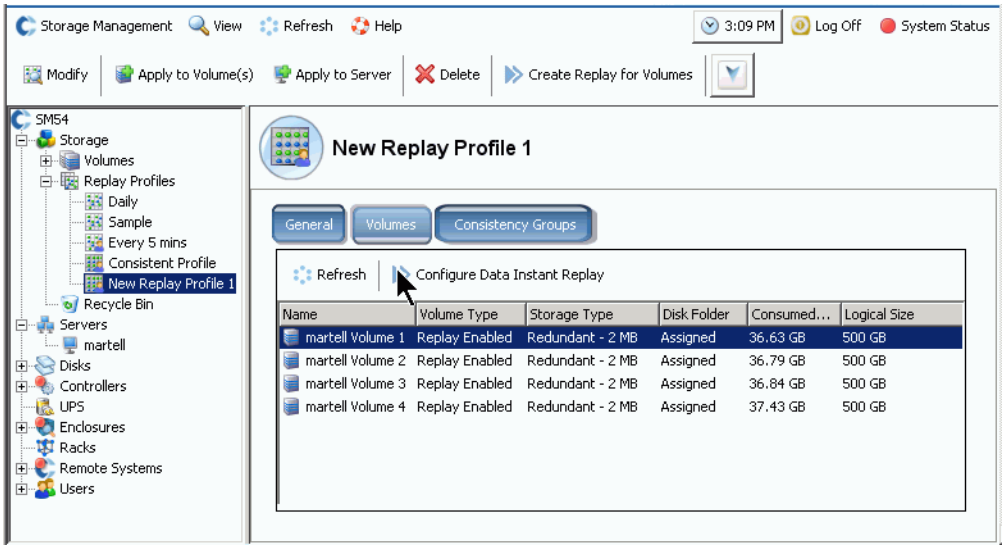


Figure 248. List of Volumes in Replay Profiles

4 Select a volume.

5 Click **Configure Data Instant Replay**.

A list of Replay Profiles appears. Replay Profiles to which this volume is attached are indicated by a check mark.

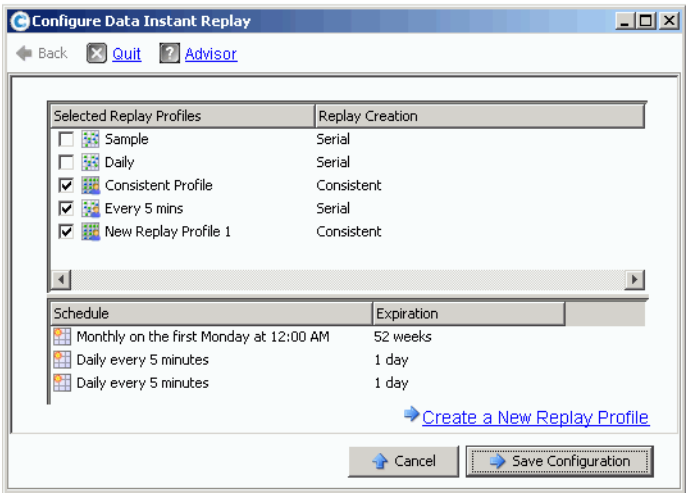


Figure 249. Volumes Attached to Replay Profiles

6 Uncheck the Volume to detach it from the Replay Profile.

7 Click **Save Configuration**. The system displays Volume information.

8 Repeat Steps 1 through 7 for each volume. When all volumes are no longer attached to the Replay Profile, you can delete it.

9 Select the **Replay Profile** again. Notice that the **Configure Data Instant Replay** button has disappeared.

10 Click **Delete**. The system asks you to confirm. Click **OK**. The Replay Profile is deleted.

Viewing Replays Attached to a Volume

1 In the system tree, select a volume.

2 Click the **Replays** tab. A list of all Replays for that volume is displayed.

3 From the shortcut menu, click on **Set Update Frequency**.

4 Toggle between types of Replay views by clicking on **Set Replay View**.

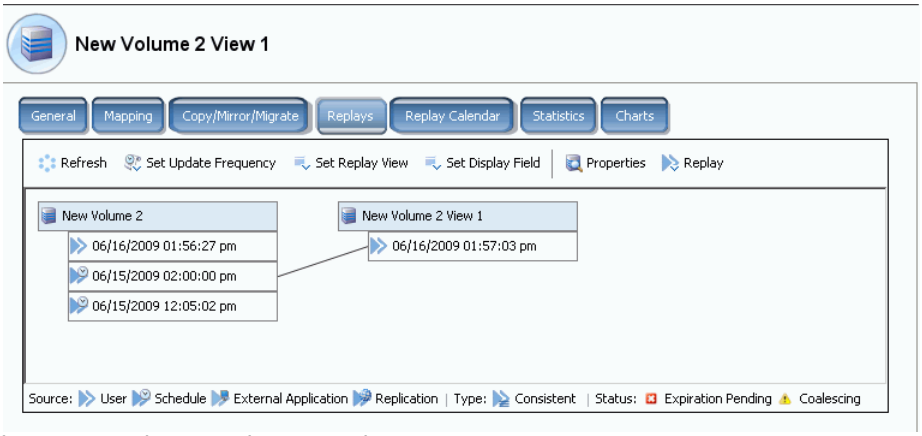


Figure 250. Volume Replay Properties Tree

Viewing Volume Replay History

1 In the system tree, select a volume. The Volume Information window appears.

2 Click the **Replay** tab. (The Replay tab appears only if Replays are scheduled for the volume.) The System Manager displays a list of Replays with the time and date taken.

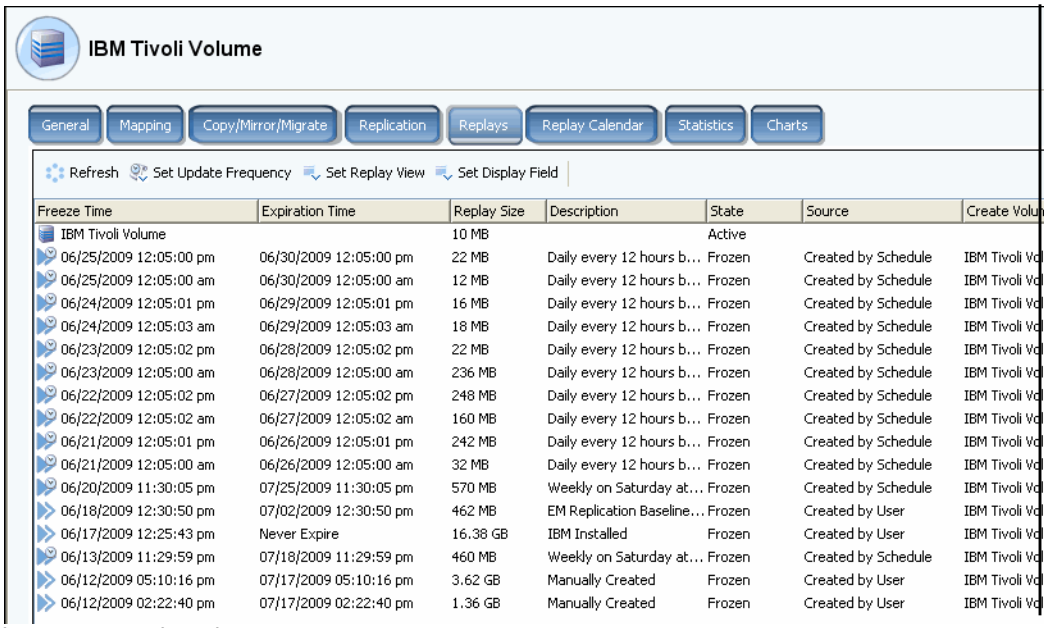

IBM Tivoli Volume
General
Mapping
Copy/Mirror/Migrate
Replication
Replays
Replay Calendar
Statistics
Charts
Refresh
Set Update Frequency
Set Replay View
Set Display Field
Freeze Time
Expiration Time
Replay Size
Description
State
Source
Create Volu
IBM Tivoli Volume 10 MB Active
06/25/2009 12:05:00 pm 06/30/2009 12:05:00 pm 22 MB Daily every 12 hours b... Frozen Created by Schedule IBM Tivoli Vol
06/25/2009 12:05:00 am 06/30/2009 12:05:00 am 12 MB Daily every 12 hours b... Frozen Created by Schedule IBM Tivoli Vol
06/24/2009 12:05:01 pm 06/29/2009 12:05:01 pm 16 MB Daily every 12 hours b... Frozen Created by Schedule IBM Tivoli Vol
06/24/2009 12:05:03 am 06/29/2009 12:05:03 am 18 MB Daily every 12 hours b... Frozen Created by Schedule IBM Tivoli Vol
06/23/2009 12:05:02 pm 06/28/2009 12:05:02 pm 22 MB Daily every 12 hours b... Frozen Created by Schedule IBM Tivoli Vol
06/23/2009 12:05:00 am 06/28/2009 12:05:00 am 236 MB Daily every 12 hours b... Frozen Created by Schedule IBM Tivoli Vol
06/22/2009 12:05:02 pm 06/27/2009 12:05:02 pm 248 MB Daily every 12 hours b... Frozen Created by Schedule IBM Tivoli Vol
06/22/2009 12:05:02 am 06/27/2009 12:05:02 am 160 MB Daily every 12 hours b... Frozen Created by Schedule IBM Tivoli Vol
06/21/2009 12:05:01 pm 06/26/2009 12:05:01 pm 242 MB Daily every 12 hours b... Frozen Created by Schedule IBM Tivoli Vol
06/21/2009 12:05:00 am 06/26/2009 12:05:00 am 32 MB Daily every 12 hours b... Frozen Created by Schedule IBM Tivoli Vol
06/20/2009 11:30:05 pm 07/25/2009 11:30:05 pm 570 MB Weekly on Saturday at... Frozen Created by Schedule IBM Tivoli Vol
06/18/2009 12:30:50 pm 07/02/2009 12:30:50 pm 462 MB EM Replication Baseline... Frozen Created by User IBM Tivoli Vol
06/17/2009 12:25:43 pm Never Expire 16.38 GB IBM Installed Frozen Created by User IBM Tivoli Vol
06/13/2009 11:29:59 pm 07/18/2009 11:29:59 pm 460 MB Weekly on Saturday at... Frozen Created by Schedule IBM Tivoli Vol
06/12/2009 05:10:16 pm 07/17/2009 05:10:16 pm 3.62 GB Manually Created Frozen Created by User IBM Tivoli Vol
06/12/2009 02:22:40 pm 07/17/2009 02:22:40 pm 1.36 GB Manually Created Frozen Created by User IBM Tivoli Vol

Figure 251. Replay History

Replay Key

The method by which a Replay is created is indicated by the Replay icon. A Replay can be created:

This indicates …	That a Replay was created …
User	By a user by selecting a volume. From the shortcut menu, select Replay > Create Replay.
Schedule	Automatically from a Replay Profile.
External Application	From an external application, such as Microsoft VSS.
Replication	Through a Replication from a remote Storage Center system.

Expiring a Replay Explicitly

1 Select a volume from the system tree.

2 In the Volume Information window shown in Figure 78 on page 101, select the **Replays** tab. A list of unexpired Replays for that volume appears.

3 Select a **Replay**.

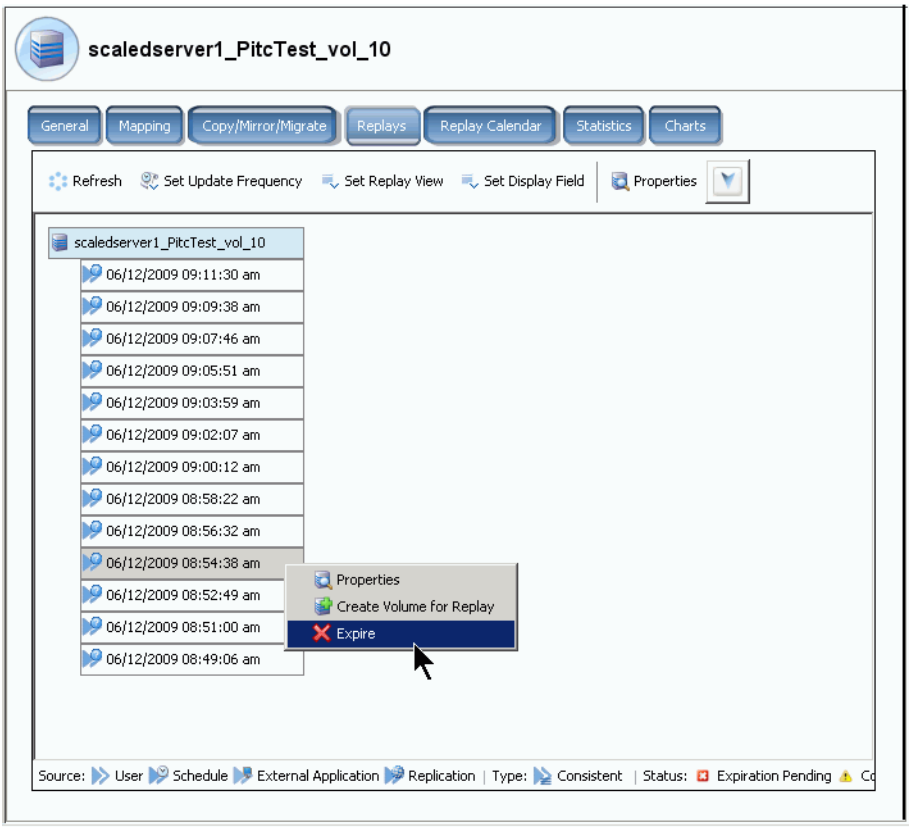


Figure 252. Expire a Replay

4 Click **Expire**. Storage Center asks you to confirm.

5 Click **Yes**. The Replay is set to be expired. Replay expiration may take a few minutes, depending on the size of the Replay.

Expiring Multiple Replays

1 Use the **Shift** or **Ctrl** keys to select more than one Replay.

2 From the shortcut menu, select **Expire**.

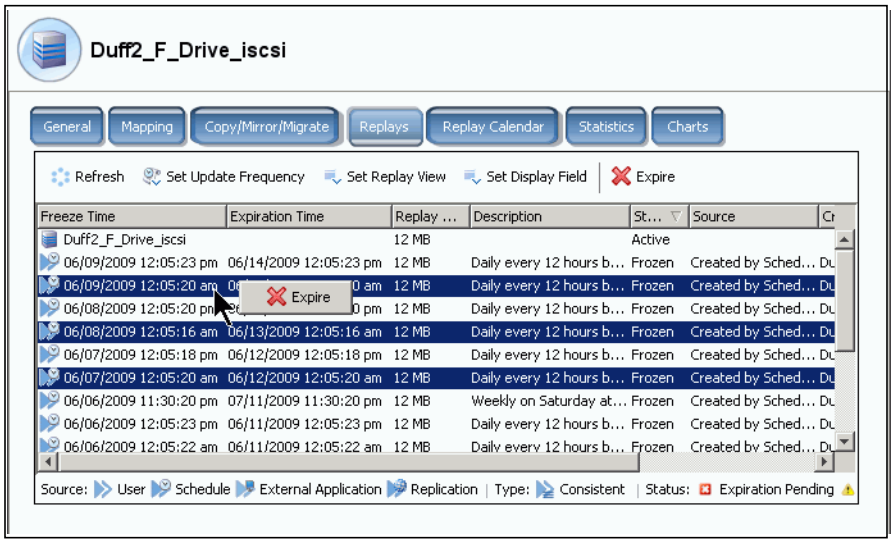

Duff2_F_Drive_iscsi
General
Mapping
Copy/Mirror/Migrate
Replays
Replay Calendar
Statistics
Charts
Refresh
Set Update Frequency
Set Replay View
Set Display Field
Expire
Freeze Time
Expiration Time
Replay ...
Description
St...
Source
Duff2_F_Drive_iscsi 12 MB Active
06/09/2009 12:05:23 pm 06/14/2009 12:05:23 pm 12 MB Daily every 12 hours b... Frozen Created by Sched...
06/09/2009 12:05:20 am 12 MB Daily every 12 hours b... Frozen Created by Sched...
06/08/2009 12:05:20 pm 12 MB Daily every 12 hours b... Frozen Created by Sched...
06/08/2009 12:05:16 am 06/13/2009 12:05:16 am 12 MB Daily every 12 hours b... Frozen Created by Sched...
06/07/2009 12:05:18 pm 06/12/2009 12:05:18 pm 12 MB Daily every 12 hours b... Frozen Created by Sched...
06/07/2009 12:05:20 am 06/12/2009 12:05:20 am 12 MB Daily every 12 hours b... Frozen Created by Sched...
06/06/2009 11:30:20 pm 07/11/2009 11:30:20 pm 12 MB Weekly on Saturday at... Frozen Created by Sched...
06/06/2009 12:05:23 pm 06/11/2009 12:05:23 pm 12 MB Daily every 12 hours b... Frozen Created by Sched...
06/06/2009 12:05:22 am 06/11/2009 12:05:22 am 12 MB Daily every 12 hours b... Frozen Created by Sched...
Expire
Source: User Schedule External Application Replication | Type: Consistent | Status: Expiration Pending

Figure 253. Select Multiple Replays

Pausing and Resuming Replays

You can pause and resume Replay creation and expiration for individual volumes, or for the entire system.

Pausing Replays across the System

1 From the Storage Management menu, choose **Volume > Replay > Pause Replay Creation**. Pausing Replay creation disables both manual and scheduled Replays for all volumes on the system.

2 If you are sure you want to disable Replays, click **Continue**. Replays are disabled. While Pause Replay is enabled, no Replays are taken for all volumes in the system.

Resuming Paused Replays across the System

To resume a paused Replay across a system

When Replays are paused across the entire system, the Storage Management menu changes. To resume Replays:

1 From the Storage Management menu, choose **Volume > Replay > Resume Replay Creation**. The Resume Replay Creation window appears.

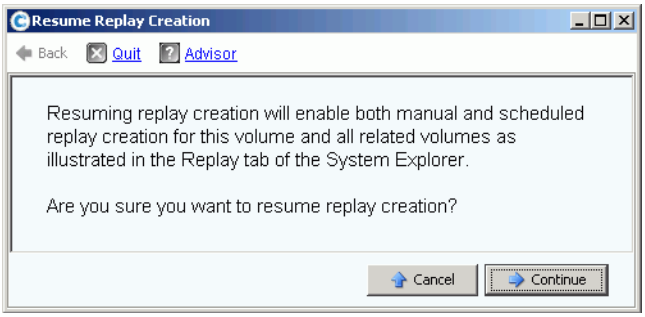

Resume Replay Creation
Back
Quit
Advisor
Resuming replay creation will enable both manual and scheduled replay creation for this volume and all related volumes as illustrated in the Replay tab of the System Explorer.
Are you sure you want to resume replay creation?
Cancel
Continue

Figure 254. Resume Replay Creation

2 Click **Continue**. The system resumes Replays across the system.

Pausing Replays for an Individual Volume

1 In the storage tree, select **Replay > Pause Replay Creation**.

2 The system asks you to confirm. Click **Continue**. The Replays are paused.

Resuming Paused Replays for an Individual Volume

Note A volume for which Replays have been paused appears as a Replay-paused volume. To resume Replays:

1 In the storage tree, select **Replay > Resume Replay Creation**. The Resume Replay Creation window appears.

2 Click **Continue**. The system resumes Replays for this volume.

Cleaning Up Orphaned Volume Replay Histories

Volume histories can become orphaned when the process of deleting a volume is interrupted. When a volume history becomes orphaned, the disk space it consumes is not released and cannot be used by other volumes. Eliminate orphaned histories to free up disk space for other volumes.

To eliminate orphaned Replay histories

1 From the Storage Management menu, choose **Volume > Clean Up Orphaned Replay Histories**. The Clean Up Orphaned Replay Histories window appears with a list of orphaned Replays. The System Manager asks you if you want to delete the orphaned Volume Histories.

2 Click **OK**. The orphaned volume histories are deleted.

Changing Volume Replay Displays

To change information displayed

1 In the system tree, select a volume. The Volume Information window appears.

2 Click the **Replay** tab. (This tab appears only if Replays are scheduled for the volume.)

3 From the shortcut menu, click **Set Display Field**. The **Set Display Field** menu appears.

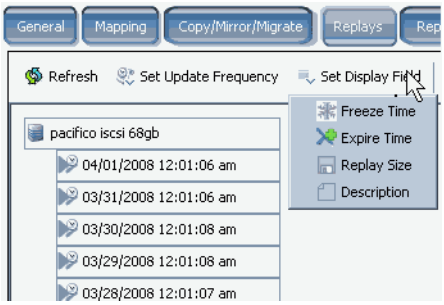


Figure 255. Set Display Menu

4 Choose to display:

- Freeze Time
- Expire Time
- Replay Size
- Replay Description

Freeze Time

To display the time the Replays were taken, from the **Set Display Field** menu shown in Figure 255 on page 315, choose Freeze Time. The System Manager displays the time at which each Replay was created.

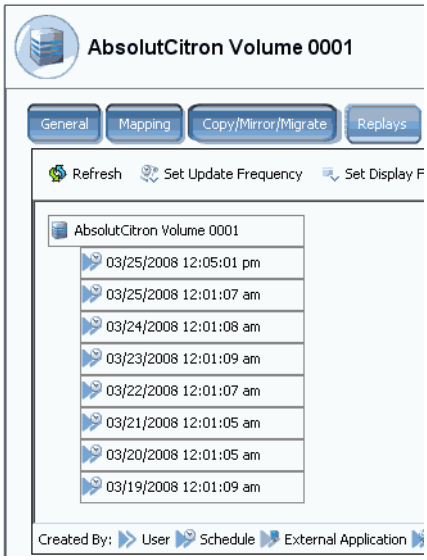


Figure 256. View Replays by Freeze Time

Expire Time

To display the time Replays will expire, from the **Set Display Field** menu shown in Figure 255 on page 315, choose **Expire Time**. Select **Refresh**. The System Manager displays the time at which each Replay will expire.

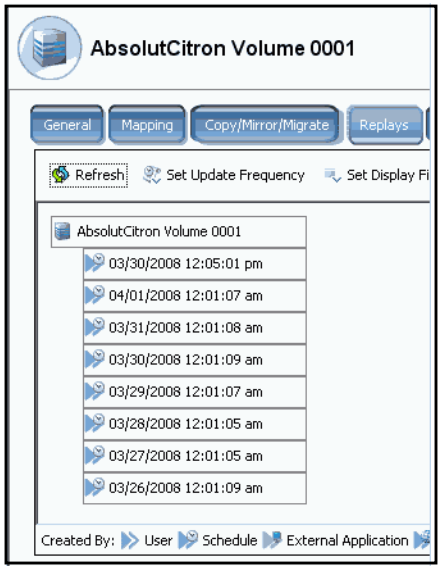


Figure 257. View Replays by Expiration Time

Replay Size

To display the amount of storage space each Replay uses, from the **Set Display Field** menu shown in Figure 255 on page 315, choose Replay Size. The System Manager displays the size of each Replay.

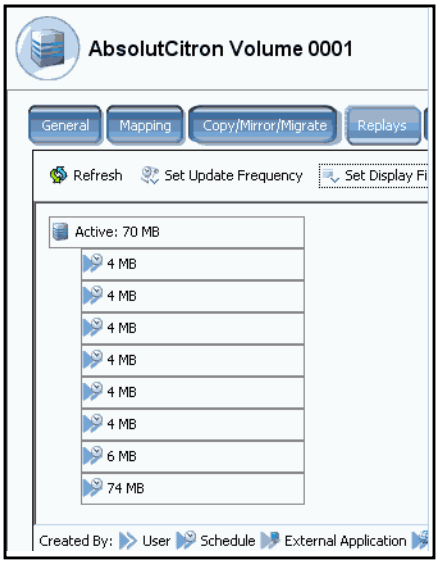


Figure 258. View Replay Size

Replay Description

To view the description for each Replay, from the **Set Display Field** menu shown in Figure 255 on page 315, choose Description. The System Manager will display the description of each Replay. Note that the default Description displays the rule that caused the Replay to be taken.

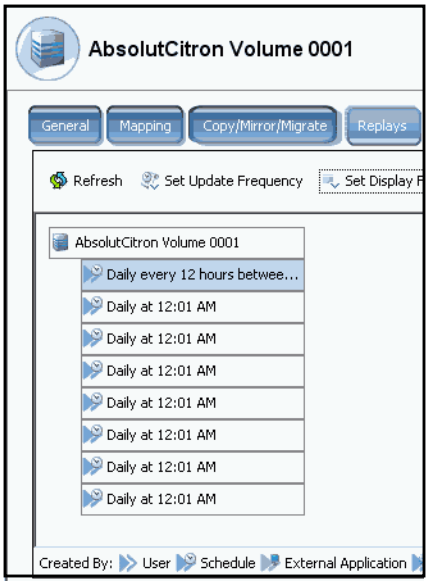


Figure 259. View Replay Description

Viewing Individual Replay Properties

1 From the system tree, select a **Volume**. The system displays general volume information.

2 Click the **Replays** tab. The System Manager displays a list of Replays for that volume.

3 From the list of Replays, select a specific Replay.

4 From the shortcut menu, select **Properties**. The **Replay Properties** window appears.

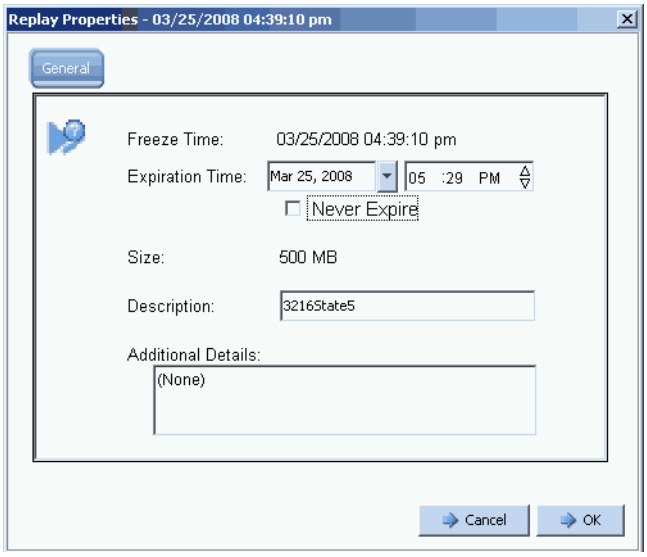


Figure 260. Replay Properties

The General Replay Properties window displays:

- Time Replay was taken
- Date and time the Replay will expire, if ever.
- Size of the Replay
- Name (Description) of the Replay
- Any additional details a user entered

5 If you change expiration time or description, click **OK**.

Deleting a Replay

Deleting a Replay is the same as Expiring a Replay. For more information, refer to Expiring a Replay Explicitly on page 312.

Viewing a Volume Replay Calendar

1 In the System Explorer window, select a volume.

2 Click the **Replay Calendar** tab. The System Manager displays the Replay calendar. Replays are color-coded.

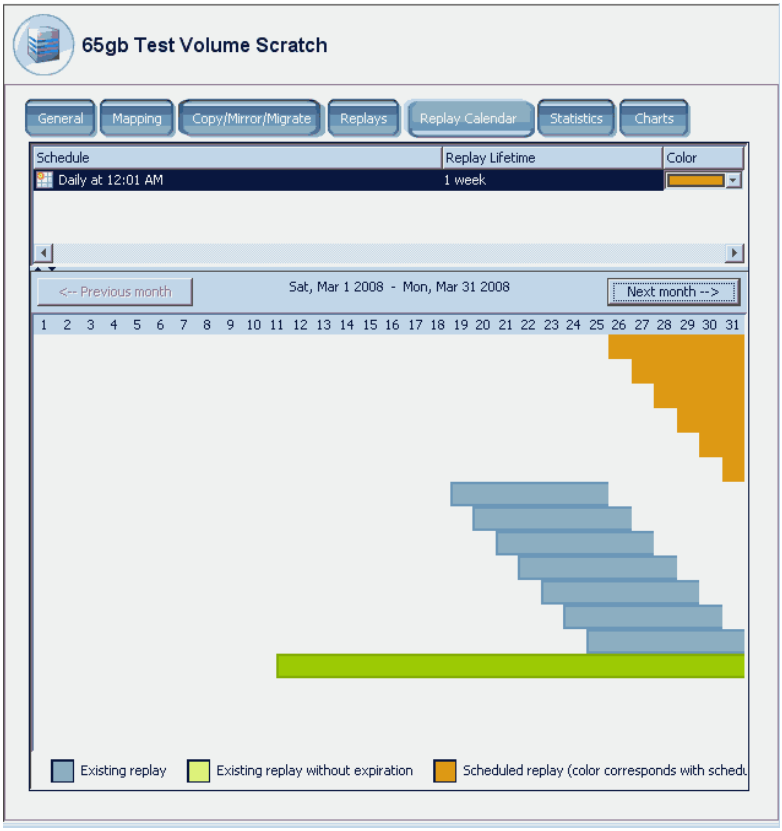


Figure 261. Replay Calendar

3 Click **Previous Month** and **Next Month** to view previous or projected months. Click the arrows to the right of the schedule to change the color of the Replay schedule bar graph.

Creating an Immediate Replay

Note Replays are best used by creating a Replay Profile, attaching it to a volume, and letting Storage Center save backup data for volumes periodically. Refer to Creating Replay Profiles on page 292.

1 From the system tree, select one or more volumes.

2 From the shortcut menu, select **Replay > Create Replay**.

3 Enter an expiration interval and a description of the Replay.

4 Click **Create Now**. A Replay is taken of the volumes you selected.

5 Select a volume. Click **Replays**. The new Replay appears in the list of Replays for that volume.

Creating Immediate Replays from a Replay Profile

1 From the system tree, select **Storage > Replay Profiles**.

2 Select a **Replay Profile**. View volumes, if you want, by clicking the **Volume** tab. A list of volumes appears.

3 From the shortcut menu, select **Create Replay for Volumes**. The **Create Replay for Volumes** window appears.

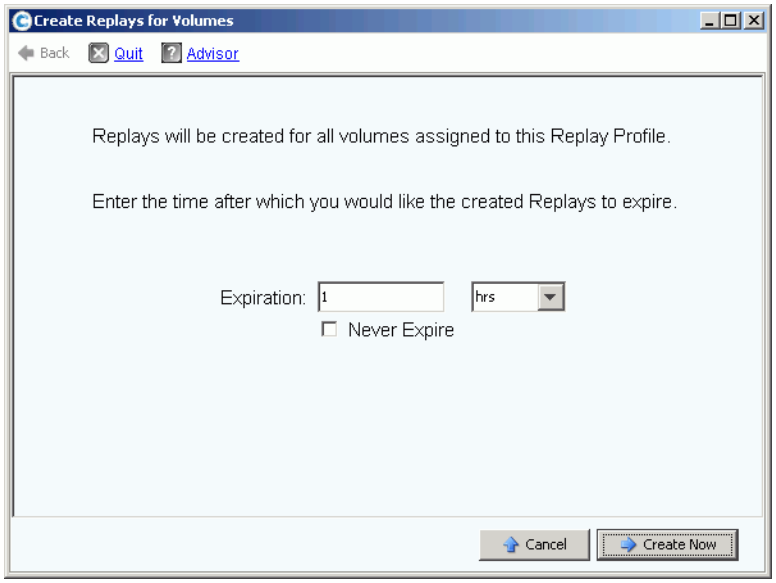


Figure 262. Create Replays for Volumes

4 Enter a time for Replays to expire in minutes, hours, day, weeks, or never.

5 Click **Create Now**.

Recovering Data

The purpose of the Replay is to provide a point-in-time copy that you can recover if data is lost or corrupted. For example, if a user inadvertently deletes a file you can create a View volume from a Replay of the volume in which the file was stored.

Creating a View Volume

1 In the system tree, select a volume.

2 Click the **Replay** tab. A list of Replays for that volume appears.

3 Select a **Replay**. From the shortcut menu, select **Create Volume for Replay**.

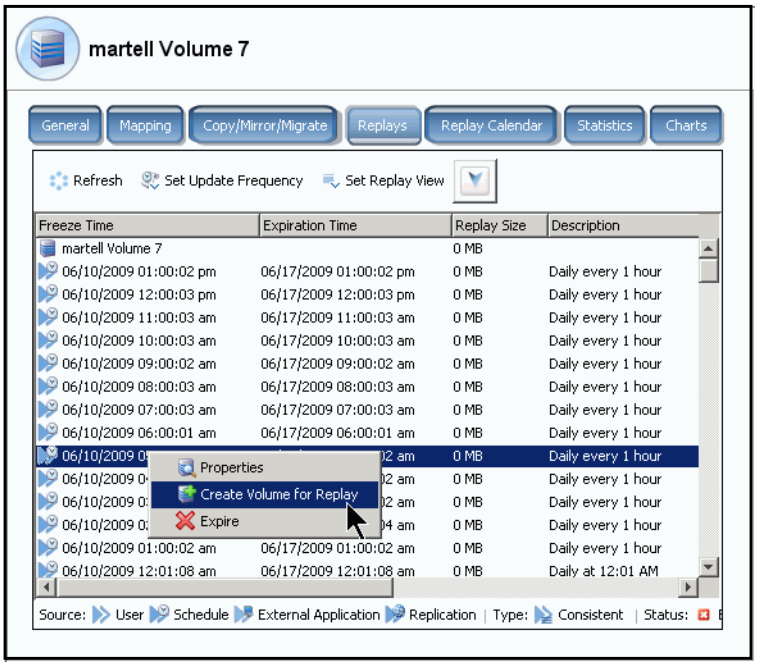


Figure 263. Select Create Volume for Replay

The **Create Volume for Replay** window appears.

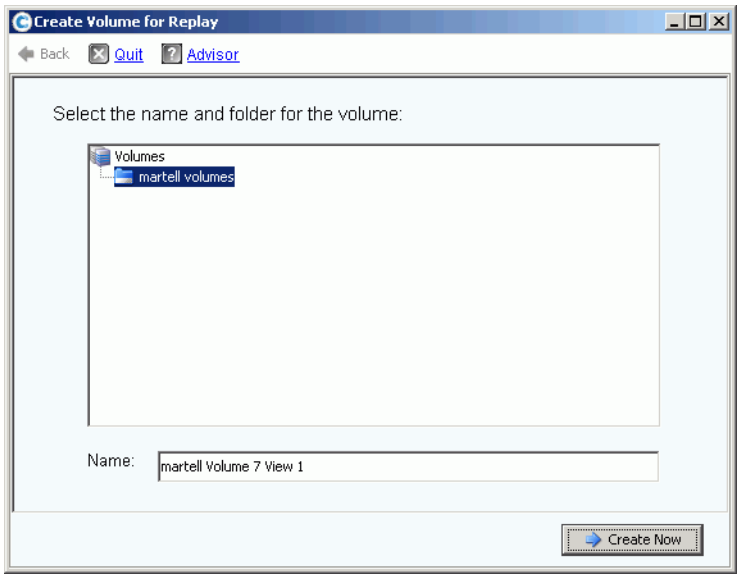


Figure 264. Create Volume for Replay Window

4 Accept the default or enter a new name.

5 Click **Create Now**. The system creates a View Volume. The **Map Volume to Server** window appears.

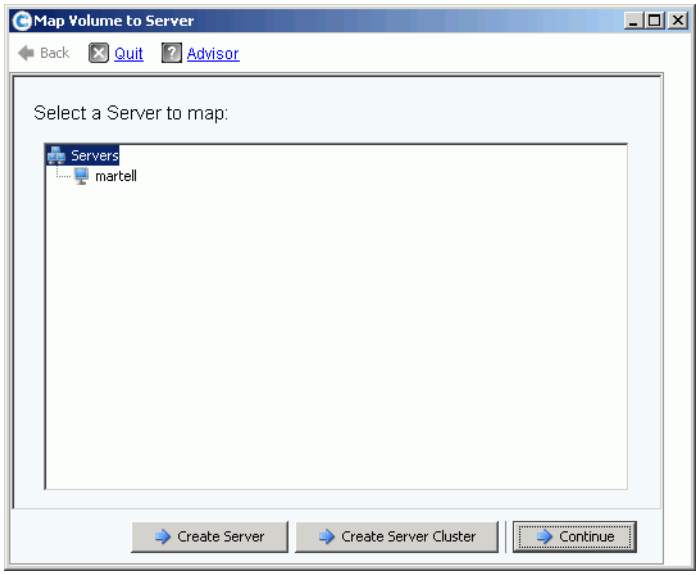


Figure 265. Map View Volume to Server

6 Do one of the following:

- **a** Click **Create Server**. Refer to Creating a Server on page 29.
- **b** Click **Create Server Cluster.** Refer to Creating a Server Cluster on page 32.
- **c** To create a Volume now:

- Select a server from the server tree.
- Click **Continue**. The system asks you to confirm.
- Click **Create Now**. The Apply Replay Profile window appears.
- Click **Apply Replay Profile** or **Skip**. The volume is created.

Viewing Consistency Groups

Note Once a consistent Replay has been taken across selected volumes, the group created from the consistent Replay appears in the Consistent Replay window.

1 From the system tree, select a **Consistent Replay Profile**.

2 Click **Consistency Group**. A window appears showing the volumes attached to the group, the freeze time, and the amount of time necessary to complete creation of all Replays in the group.

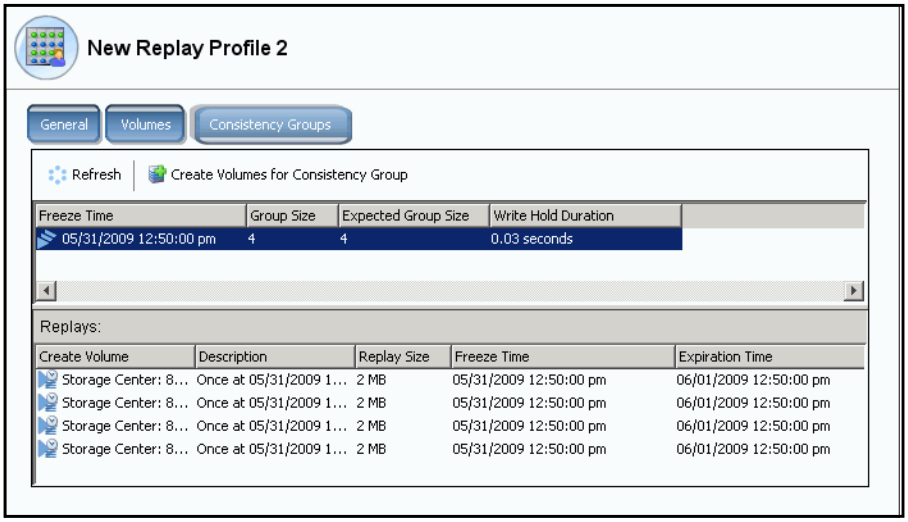


Figure 266. Consistency Groups

Creating Volumes from Consistency Groups

1 From the system tree, select a Consistent Replay Profile.

2 Click on **Consistency Group**.

3 From the shortcut menu, select **Create Volumes for Consistency Groups**. The **Create Volumes for Consistency Groups** window appears.

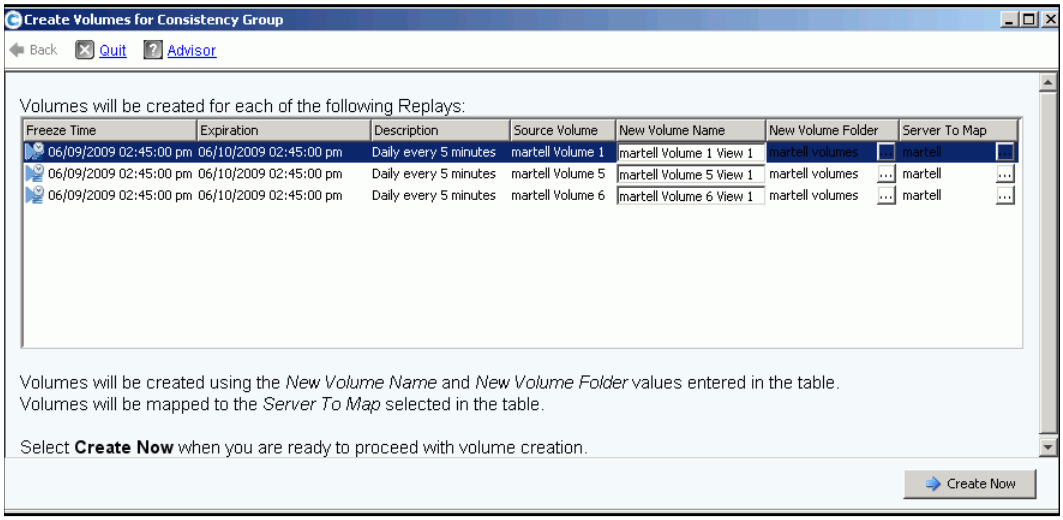


Figure 267. Create Volumes for Consistency Groups

4 The system enters default names for the new volumes. Accept the default or enter a name in the **New Volume Name** field.

5 The system assumes the volume folder will be the same as the previous folder. To change the folder in which these volumes will be created

a Click the expand button next to the **New Volume Folder** field.

b Select a new volume folder.

c Click **Continue**. The **Create Volumes for Consistency Groups** window reappears.

6 The system assumes the new volumes will be mapped to the same server as the current volumes. To change the server to which these volumes will be mapped

a Click the expand button next to the **Select a Serve**r field.

b Select a new server.

c Click **Continue**.The **Create Volumes for Consistency Groups** window reappears.

7 Click **Create Now**. The system creates the volumes. The new View volumes appear in the system tree.

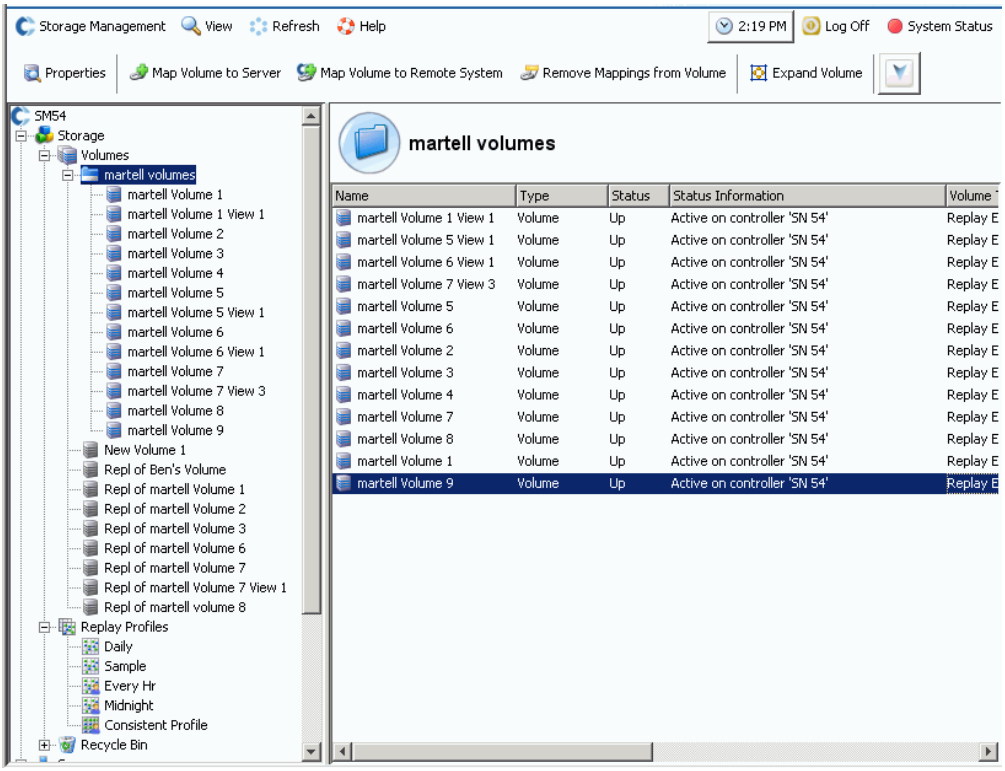

Storage Management
View
Refresh
Help
2:19 PM
Log Off
System Status
Properties
Map Volume to Server
Map Volume to Remote System
Remove Mappings from Volume
Expand Volume
SM54
Storage
Volumes
martell volumes
martell Volume 1
martell Volume 1 View 1
martell Volume 2
martell Volume 3
martell Volume 4
martell Volume 5
martell Volume 5 View 1
martell Volume 6
martell Volume 6 View 1
martell Volume 7
martell Volume 7 View 3
martell Volume 8
martell Volume 9
New Volume 1
Repl of Ben's Volume
Repl of martell Volume 1
Repl of martell Volume 2
Repl of martell Volume 3
Repl of martell Volume 6
Repl of martell Volume 7
Repl of martell Volume 7 View 1
Repl of martell volume 8
Replay Profiles
Daily
Sample
Every Hr
Midnight
Consistent Profile
Recycle Bin
martell volumes
Name
Type
Status
Status Information
martell Volume 1 View 1 Volume Up Active on controller 'SN 54'
martell Volume 5 View 1 Volume Up Active on controller 'SN 54'
martell Volume 6 View 1 Volume Up Active on controller 'SN 54'
martell Volume 7 View 3 Volume Up Active on controller 'SN 54'
martell Volume 5 Volume Up Active on controller 'SN 54'
martell Volume 6 Volume Up Active on controller 'SN 54'
martell Volume 2 Volume Up Active on controller 'SN 54'
martell Volume 3 Volume Up Active on controller 'SN 54'
martell Volume 4 Volume Up Active on controller 'SN 54'
martell Volume 7 Volume Up Active on controller 'SN 54'
martell Volume 8 Volume Up Active on controller 'SN 54'
martell Volume 1 Volume Up Active on controller 'SN 54'
martell Volume 9 Volume Up Active on controller 'SN 54'

Figure 268. Consistency Groups View Volumes

Deleting a View Volume

1 Select the volume. From the shortcut menu, select **Delete**. Storage Center asks you to confirm.

2 Click **Yes**. Storage Center moves the volume to the Recycle Bin.

Note You can recover the view volume until the Recycle Bin is emptied.

10 Remote Instant Replay

Introduction 328
Synchronous and Asynchronous Replications 329
Estimating Bandwidth 330
Disallowing Replications Between Storage Center Systems 331
Establishing Physical Connectivity 332
Defining a QoS 333
Creating Volumes on a Remote System 338
Creating Replications 341
Viewing Replications 346
Modifying Replications 348
Re-creating a Volume from a Replication 349

Introduction

An Asynchronous Remote Instant Replay copies Replays; a Synchronous Replay copies only the raw data of a volume. Storage Center presents two means of creating Remote Instant Replays:

- The most efficient means is through Enterprise Manager. Enterprise Manager is a separately-licensed application that manages and monitors multiple Storage Center systems. It greatly simplifies Remote Instant Replay.
- You can also create a Remote Instant Replay through a Storage Center system. The procedure, described in this chapter involves:
  - **a** Establishing connectivity to a remote Storage Center system.
  - **b** Create a Quality of Service (QoS) definition to schedule replications.
  - **c** (Optional) Simulate a replication so that you can gauge the impact replications will have on a system.
  - **d** Create a target volume on the remote system. Map the target volume to the remote system.
  - **e** Select a volume or volumes to replicate.
  - **f** Choose to replicate a volume to an external device and maintain updates (mirror) or not maintain updates (copy).

Keep in mind:

- The source system initiates replication. Data is copied from the source system to the destination system.
- The destination system is the system receiving replication data.

A Storage Center system can replicate volumes to a remote system and simultaneously be the target of replication from a remote system.

Although remote replication is an integral part of a Disaster Recover Plan, it is not the whole plan. Make sure you have a Disaster Recovery Plan in place to determine the most appropriate strategies to mitigate threats or disasters and to recover access to data.

Synchronous and Asynchronous Replications

Synchronous Replication

Synchronous replication makes sure that a write is successfully written to the remote system before returning a Successful Completion command to the server IO request. The Storage Center does not acknowledge completion of the write-back to the Server until both the write IO to the local volume and the IO sent to the remote system are complete. This means both the replicating volume and the replicated volume are fully synchronized - there is no data loss in the event of a failure on the source system. Replays, including Data Instant Replays and Remote Instant Replays that are taken on the Replicating System are not copied to the Remote system. Typically Synchronous replication is used only to load storage from other vendors, or to enable immediate remote volume availability during Disaster Recovery.

If connectivity is lost between the Replicating System and the Remote Connection system, the entire data volume must be re-copied to ensure all data is present and accounted for in both locations. This also means historical instant Replay information will not be available from the replicated volume.

Asynchronous Replication

Asynchronous replication acknowledges a write IO back to the server as soon as it has been completed on the source system. The write IO is also queued for delivery to the Remote system. This allows for more efficient link utilization and data transfer optimization. It also means that in the event of a local failure, writes present on the source system may not be present on the remote system.

Note When doing Async replication, you have the option to Replicate the active Replay. If you do not specify this option *and* no Replays have been taken, replication does not begin to replicate data until the first Replay is taken. (Until that time all data resides in the Active Replay.) Not selecting to replicate active volumes is appropriate for volumes that have little change activity and are not mission critical.

Asynchronous Replication and Data Instant Replay

Asynchronous replication uses Data Instant Replay to create checkpoints between the source volume and the destination volume. A Replay created on the Replicating System is sent intact to the Remote Connection system.

Replay checkpoints serve as re-synchronization points, reducing the amount of data that needs to be transferred from the source system to the destination system in the event of a communication failure between the Replicating System and the Remote Connection system.

Replay checkpoints copied to the Remote Connection system also serve as remote recovery points in the event the data must be recovered from the Remote Connection system.

Replays are scheduled regularly on the Replicating (local) System as described in Data Instant Replay on page 283. Specifying Replay schedules on the Remote Connection system is not recommended; they are provided by the schedule on the Replicating System.

Before you replicate a volume, make sure of the following:

- Define a remote system to replicate to.
- Replications are mapped to or from the remote system.
- There is at least one volume on the remote system to replicate to, of equal or greater size than the volume you are replicating.

Estimating Bandwidth

Replication bandwidth cost, capacity, availability, and usability are key considerations when developing a replication plan. Consider the time and cost of replicating the initial data load from the Replicating System to the Remote Connection system. Consider how far behind a replication is allowed to become after it has been established. The larger the tolerance for missing data, the less you have used peak utilization time, requiring less overall bandwidth that may go under-utilized during off hours. There are two basic strategies in determining the amount of bandwidth required for replication. Have a good idea of the volumes you want to replicate from your Disaster Recovery Plan. It is very possible you will use the first strategy to get started and the second once you are in production.

- Derive the Required Bandwidth based on modeling the list of volumes to be replicated and the recovery requirements.
- Replicate data as required. Add volumes to the replication as bandwidth allows. Tune Replay schedules to meet Disaster Recovery requirements with the available bandwidth.

There are other considerations outside the realm of the Storage Center that can affect replications. Nearly all of these considerations relate to using iSCSI connectivity for replication.

- Quality of the link (dropped packets, fragmented packets, resends, link down)
- Competition on the link (other traffic)
- Ability of the link to handle bursts of traffic
- Ability of the link to handle larger packet sizes
- Latency on the link
- Security on the link (if encryption is required)
- Cyclical business cycles affecting bandwidth requirements

Disallowing Replications Between Storage Center Systems

By default, Storage Centers accept replications from other Storage Centers. If the systems can see each other via FC or configured iSCSI connectivity, you are allowed to define replications between them (if properly licensed).

To disallow replications between systems

1. From the Storage Management menu, select **Volume > Replication > Allow Replications to/from Remote Systems**. The **Remote System** window appears.
2. From the pull-down menu, select **Not Allowed**.
3. Click **OK**.

Establishing Physical Connectivity

Both the Replicating System and the Remote system must have front end port visibility for the desired Replication type. These ports may be in the form of iSCSI or FC depending on the connectivity choice.

WWN visibility of the front-end ports on controllers between the Remote Connection and Replicating Systems must include both Primary and Reserved ports (from dual controller systems) to withstand failovers. Replication messaging uses any and all connections between the systems; however, only Primary ports carry replication data to the Remote Connection system.

Remote FC cards are automatically recognized.

Viewing Server Connectivity

1 From the **View** menu, select **Server Connectivity**.

Note **Server Connectivity** appears only if the system does not have Virtual Ports.

The **Server Connectivity** window appears.

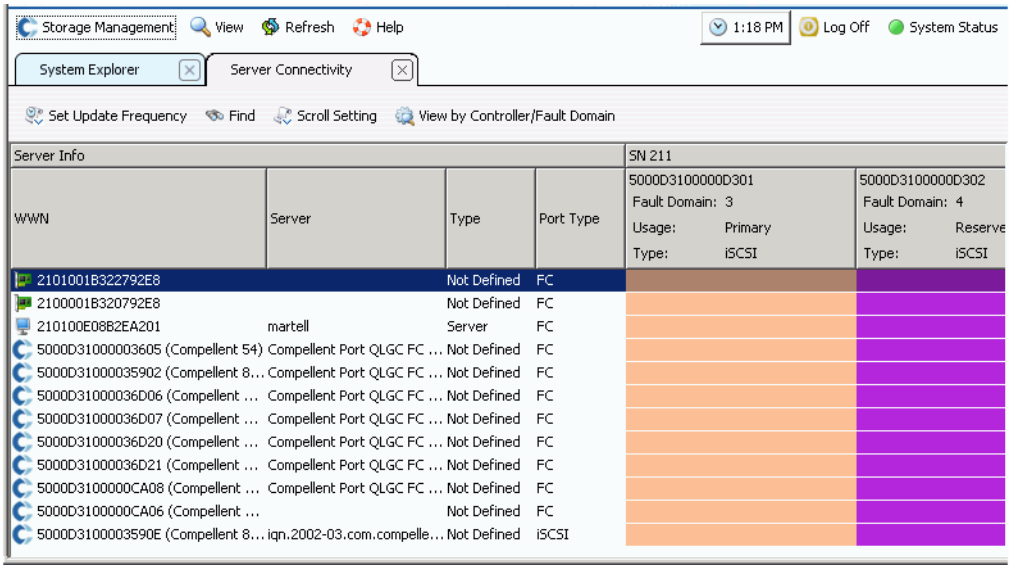


Figure 269. Server Connectivity

Remote systems appear with a Compellent logo.

Defining a QoS

Before you create a Replication, create a QoS Definition to choose a link speed and the amount of bandwidth that Replications are allowed to use between the systems.

To define a QoS definition

1 From the Storage Management menu, select **Volume** > **Replication** > **Manage Replication QoS Definitions**. The **Manage Replication QoS Definitions** window appears with a list of current QoS definitions.

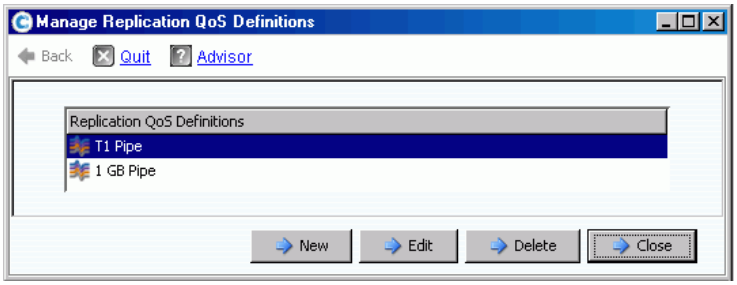


Figure 270. Manage Replication QoS Definitions

2 Click **New**. The **Manage Replications QoS Definitions** window appears.

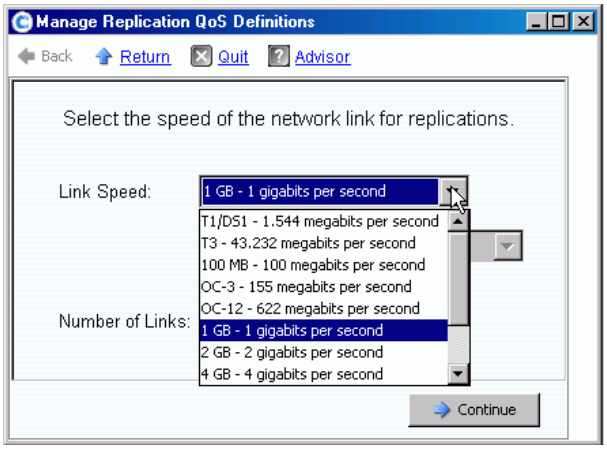

Manage Replication QoS Definitions
Back
Return
Quit
Advisor
Select the speed of the network link for replications.
Link Speed:
1 GB - 1 gigabits per second
T1/DS1 - 1.544 megabits per second
T3 - 43.232 megabits per second
100 MB - 100 megabits per second
OC-3 - 155 megabits per second
OC-12 - 622 megabits per second
Number of Links:
1 GB - 1 gigabits per second
2 GB - 2 gigabits per second
4 GB - 4 gigabits per second
Continue

Figure 271. Define Link Speed

3 Select a link speed that most closely represents your link or select **Other** to enter the appropriate link speed. The link speed is used to size and utilize replication link resources to the remote system. This setting defines link attributes only.

4 If you have more than one link to the remote system, enter that number. This adjusts the maximum bandwidth allowed without changing the communication link settings. This setting distributes link resources.

5 Click **Continue**. The system asks if you want to perform bandwidth limiting.

Bandwidth limiting incurs additional overhead on the system and is inherently less bandwidth efficient. Use bandwidth limiting only in cases where the link is truly shared with other traffic. For Replications to use all of the bandwidth on the link at all times, click **No**. If you click **No**, continue with Step 6.

a To create a bandwidth limit schedule, click **Yes**.

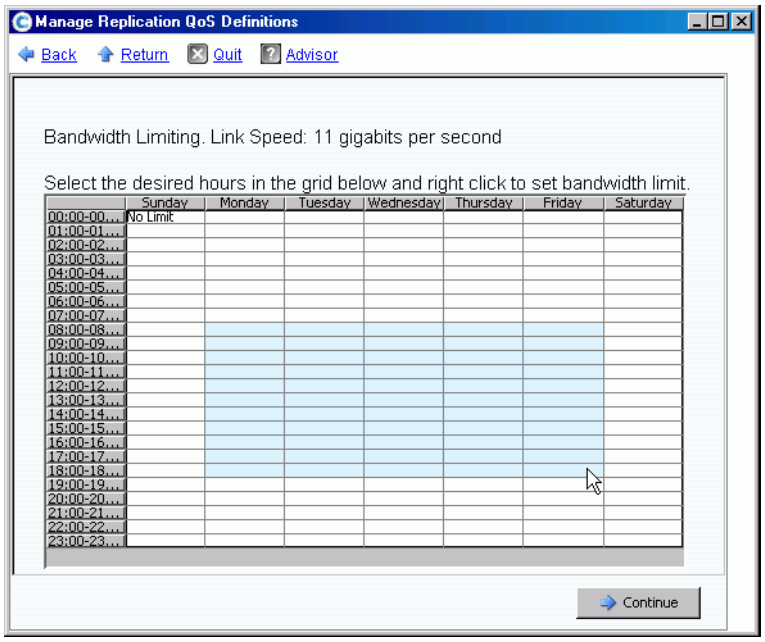


Figure 272. Bandwidth Limiting Window

b Click and drag the mouse pointer down and to the right to select hours.

c Select a percentage bandwidth limit. The percentage and hours bandwidth will be limited are displayed.

6 Click **Continue**.

7 Enter a **Name** for the QoS Definition and any optional notes describing it.

8 Click **Create Now**. The QoS is created.

Viewing QoS Definitions

1 In the system tree, select **QoS Definitions**. A list of definitions appear.

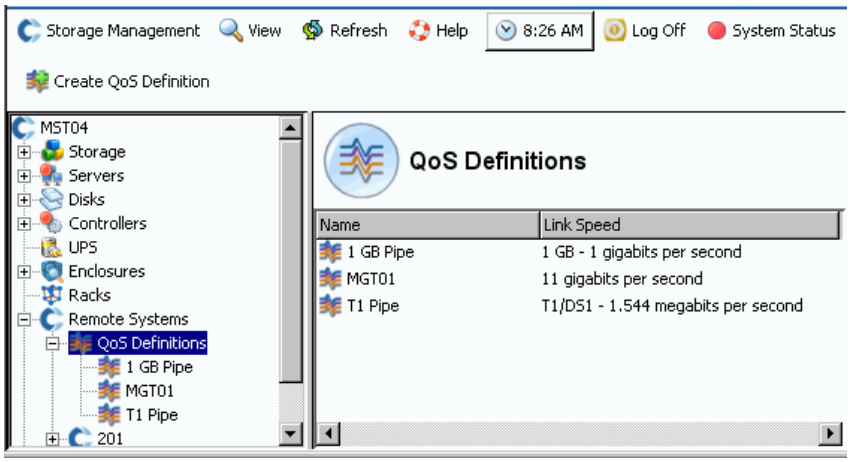


Figure 273. List of QoS Definitions

2 Select a **QoS Definition** from the list. The QoS window with the **General** tab selected appears.

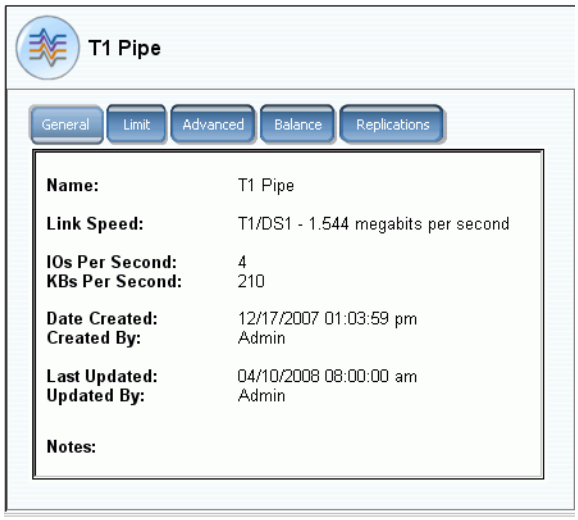


Figure 274. General QoS Window – General tab

3 To view bandwidth limit, click the **Limit** tab.

4 To view advanced information, click the **Advanced** tab.

5 To view the proposed balance between local and remote controllers, click the **Balance** tab.

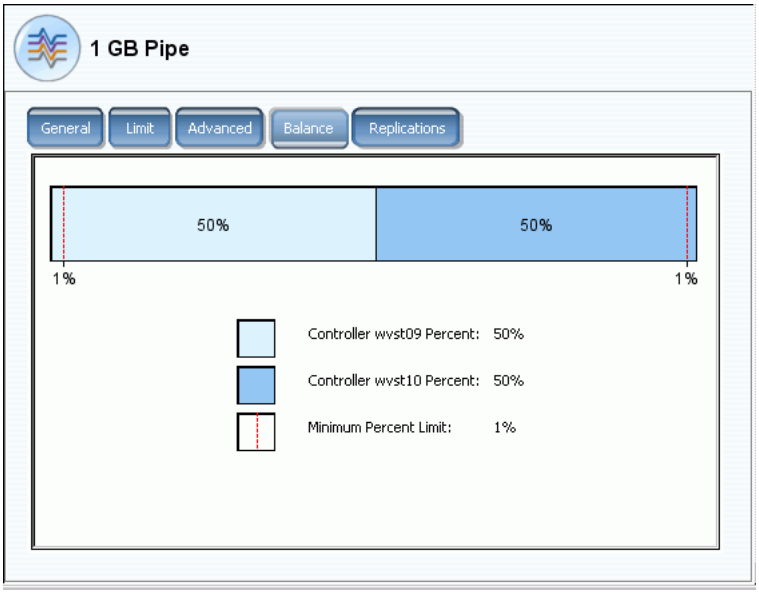


Figure 275. QoS Balance

6 To view Replications that are using this QoS definition, click the **Replications** tab. The system manager displays Replications using this QoS. Changing QoS Definition Properties

To change QoS definition properties

1 In the system tree, select an individual QoS definition.

2 From the QoS shortcut menu, select **Properties**. The **QoS Definition Properties** window appears.

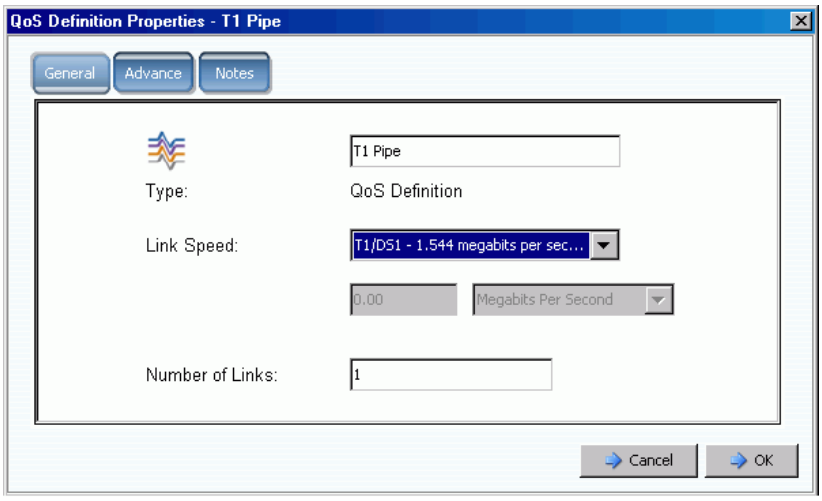


Figure 276. General QoS Properties

3 Change any of the following:

- QoS name
- Link speed

- Number of links

Note Advanced QoS properties can only be modified under the guidance of Dell Support Services.

4 Click **Notes** to change or add QoS Property notes.

Creating Volumes on a Remote System

A volume mapped to (or created for) the target system is the destination volume for a replication.

To create a volume on a remote system

1 From the system tree, select a remote system.

2 From the shortcut menu, select **Create Volumes**. The **Create Volumes** window appears. Make sure that **Map volumes to this server using default settings upon creation** box is checked.

3 Select either **Copy Selected Volume when adding a volume** or **Use My Volume Defaults when adding a volume**. (To change your volume defaults, refer to My User Volume Defaults on page 272.)

4 To create multiple volumes, continue to click **Add Volume**.

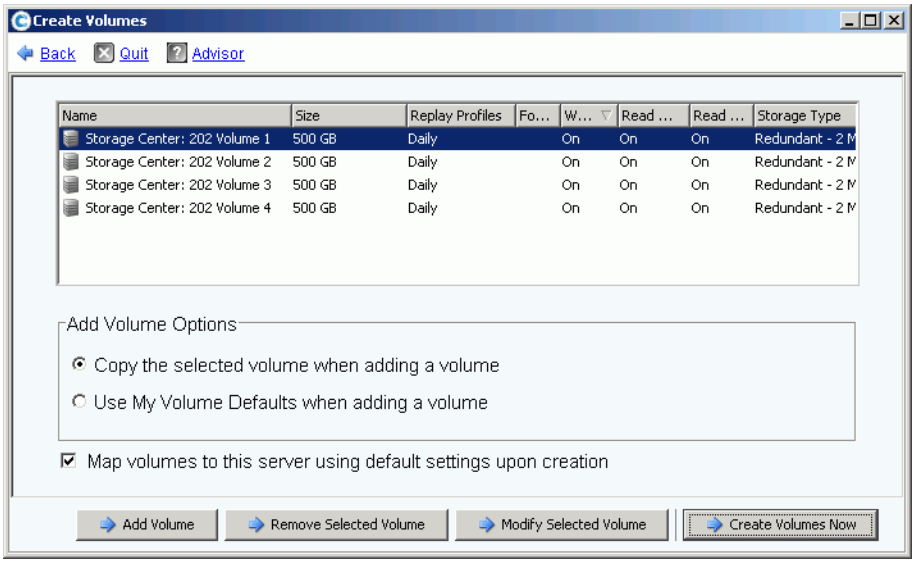


Figure 277. Creating Volumes for Remote System

5 Click **Create Volumes Now**. The system advises you of its progress. The Mapping window for the first volume appears. Notice that the server to which this volume is mapped is a Remote System. The default name of the volume reflects the Remote System acting as a server to which this volume is mapped.

Mapping an Existing Volume to a Remote System

If a volume to be replicated already exists, map it to the Remote System.

1 In the system tree, select an unmapped volume. (Alternatively, you can select a multiple volumes. From the list of volumes in the main window, select more than one volume.)

2 From the shortcut menu, select **Map Volume to Remote System**. A list of Remote Systems appears.

3 Select a remote system. Click **Continue**. The system asks you to confirm. If your User Volume Defaults permit, you can select Advanced options. Refer to Advanced Mapping Options on page 74.

4 Click **Create Now**. The volume is mapped to the Remote System.

Viewing Mapping Properties of Remote System

1 From the system tree select a Remote System.

2 Click the **Mapping** tab. Volumes mapped to the Remote System are displayed.

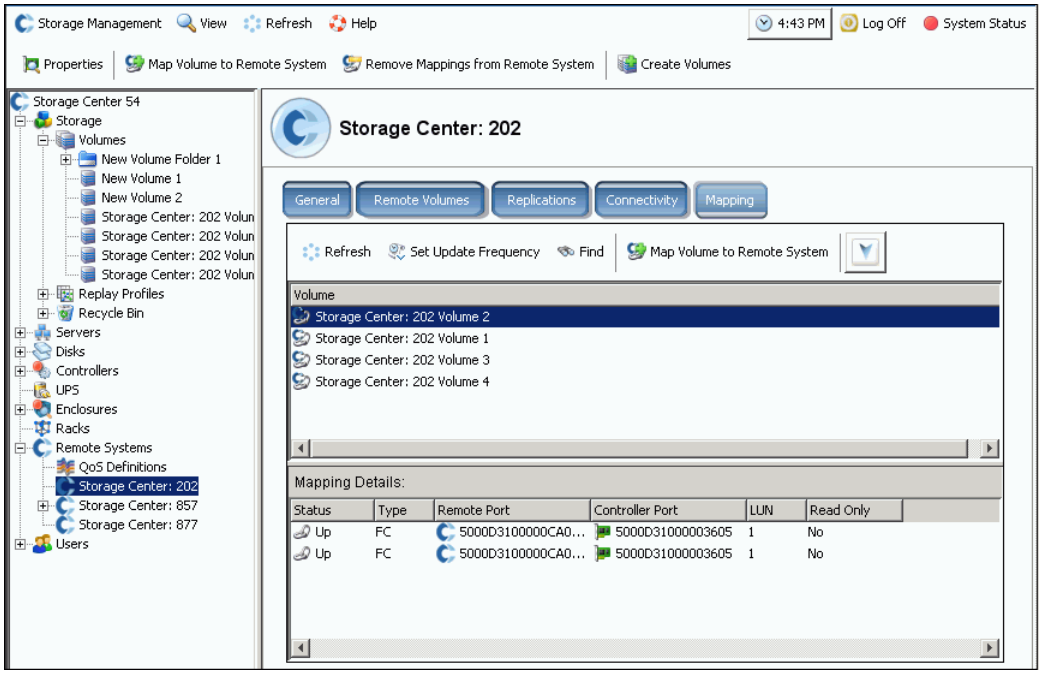


Figure 278. Remote System Mapping Window

Unmapping Volumes from Remote System

Note A volume mapped to a Remote System is usually the destination of a Replication. Unmapping a volume from a Remote System can disrupt an ongoing Replication.

1 From the system tree select a Remote System.

2 From the shortcut menu, select **Remove Mappings from Remote System**.

3 Select volumes from which to remove mappings.

4 Click **Continue**. The system asks you to confirm.

5 Click **Remove Mappings Now**. In the system tree, the volumes appear as gray icons, signifying that they are not mapped.

Viewing Copy/Mirror/Migrate Events

1 From the **View** menu, choose **Copy/Mirror/Migrate**. The CMM view appears.

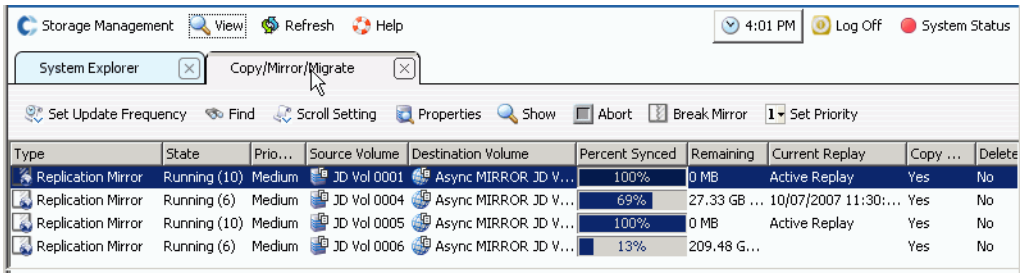


Figure 279. Copy/Mirror/Migrate View

This view displays:

- **Type**
- **State**
- **Priority**
- **Source volume**
- **Destination volume**
- **Percent synchronized**
- **Size of data that remains to be synchronized**
- **Current Replay**
- **Copy History**
- **Whether the system will delete the volume after migration (Migrate)**
- **Whether the system performs a reverse mirror after migration (Mirror)**

Creating Replications

Creating a Mirrored Replication

You can replicate a volume to an external device and maintain updates (mirror).

To create a mirrored Replication

1. Select a volume to replicate.
2. From the shortcut menu select **Replicate Volume to External Device and Maintain Updates (Mirror).**
3. Select a remote volume or external device disk to replicate to.
4. Click **Continue**.
5. Select **Options**. Choose either **Asynchronous** or **Synchronous**.
6. Choose a **QoS definition** or create a new QoS definition. Refer to Defining a QoS on page 333.
7. Select or clear to **Replicate the Active Replay**.
8. Select or clear **Deduplication**.
9. Click **Continue**. If the source volume does not have a Data Instant Replay schedule, Storage Center asks you to create one. Click **Continue**. The System Manager displays the Replication information.
10. Click **Replicate Now**. The Replication is created.

Creating a Copy Replication

You can also replicate a volume to external device and not maintain updates (copy).

To create a copied Replication

1. From the Storage Management window, select **Volume** > **Replication** > **Replicate Volume** > **Replicate Volume to an External Device (Copy)**.
2. Select a volume to replicate. Click **Continue**.
3. Select a remote volume or external device disk to which you will Replicate the selected volume. Click **Continue**.
4. Select **Asynchronous** or **Synchronous**.
5. Choose a QoS definition or create a new QoS definition. Refer to Defining a QoS on page 333.
6. Select or clear **Replicate the Active Replay**.
7. Select or clear **Deduplication**.
8. Click **Continue**. If the source volume does not have a Data Instant Replay schedule, Storage Center asks you to create one. Click **Continue**. The System Manager displays the Replication information. Click **Replicate Now**. The Replication is created.

Creating a Simulated Replication

Simulated replications determine an optimal balance of volumes, Replay schedules, bandwidth schedules, and recovery.

To create a simulated replication

1 From the system tree, select a volume. Make sure that it is Replay Enabled.

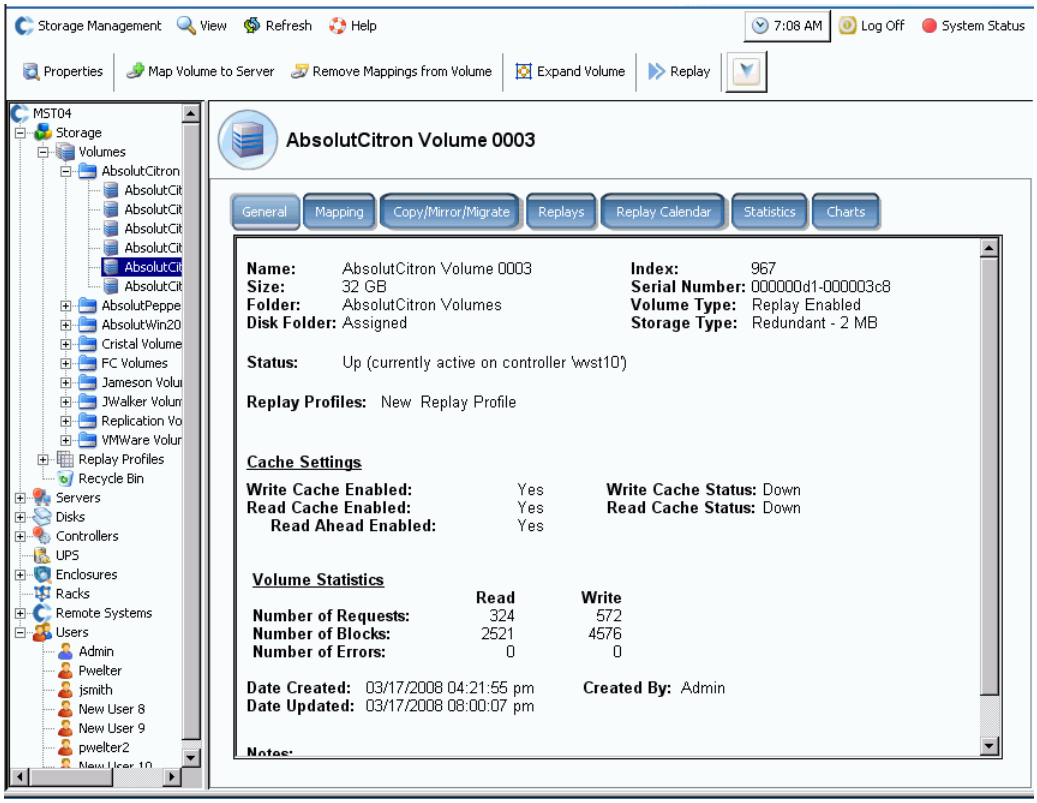


Figure 280. Replay-enabled Volume

2 From the shortcut menu, select **Replicate to Simulation**.

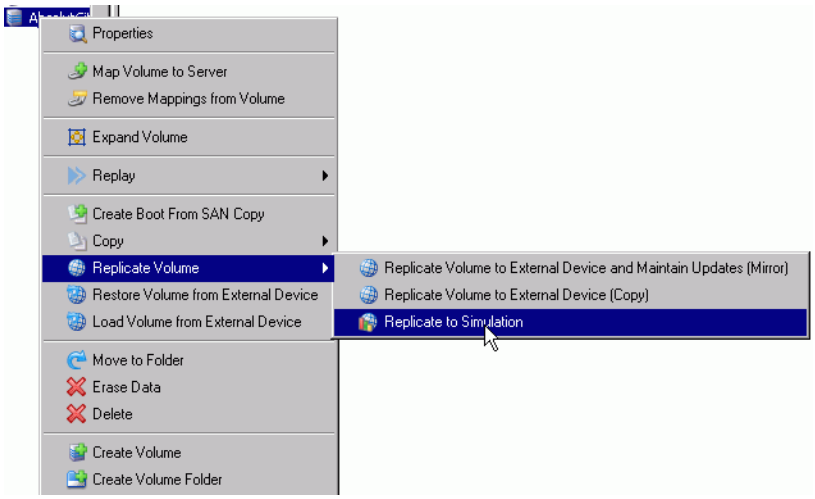


Figure 281. Replicate Volume Menu

The **Replicate to Simulation** window appears.

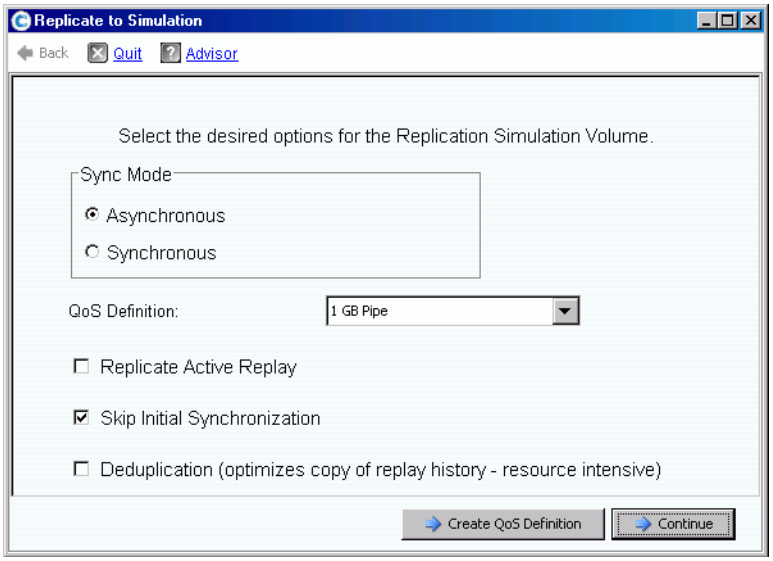


Figure 282. Replicate to Simulation Window

3 Select either **Asynchronous or Synchronous**.

4 Choose a **QoS definition**.

5 Select or clear **Replicate Active Replay**.

6 Select or clear **Skip Initial Synchronization**.

7 Select or clear **Deduplication**. Click **Continue. The** System Manager asks you to confirm.

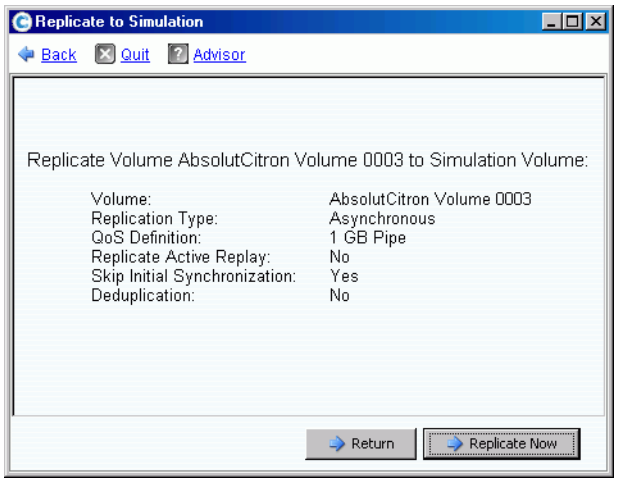


Figure 283. Confirm Replication Simulation

To view simulated Replication progress

1 Select the volume.

2 Click the **Replication** tab. A window displaying Replication information appears.

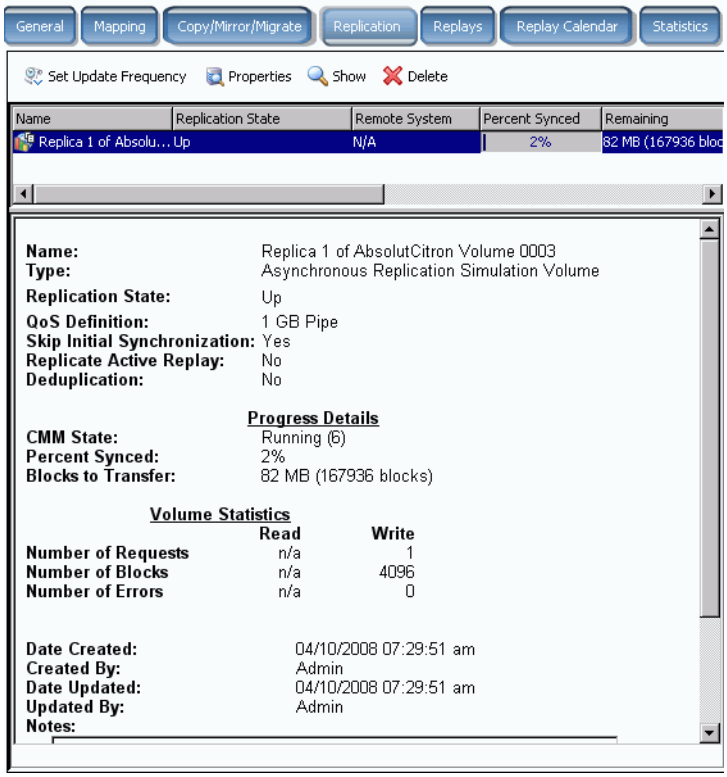


Figure 284. View Simulated Replication

A Remote System is not applicable because this is not a genuine Replication. The progress details inform you of the Copy/Mirror/Migrate state, the percentage synched, and the number of blocks to transfer.

Changing Source Volume Properties

To change replication source volume properties

1 Select a Replication.

2 From the shortcut menu, select **Properties > Source Volume**.

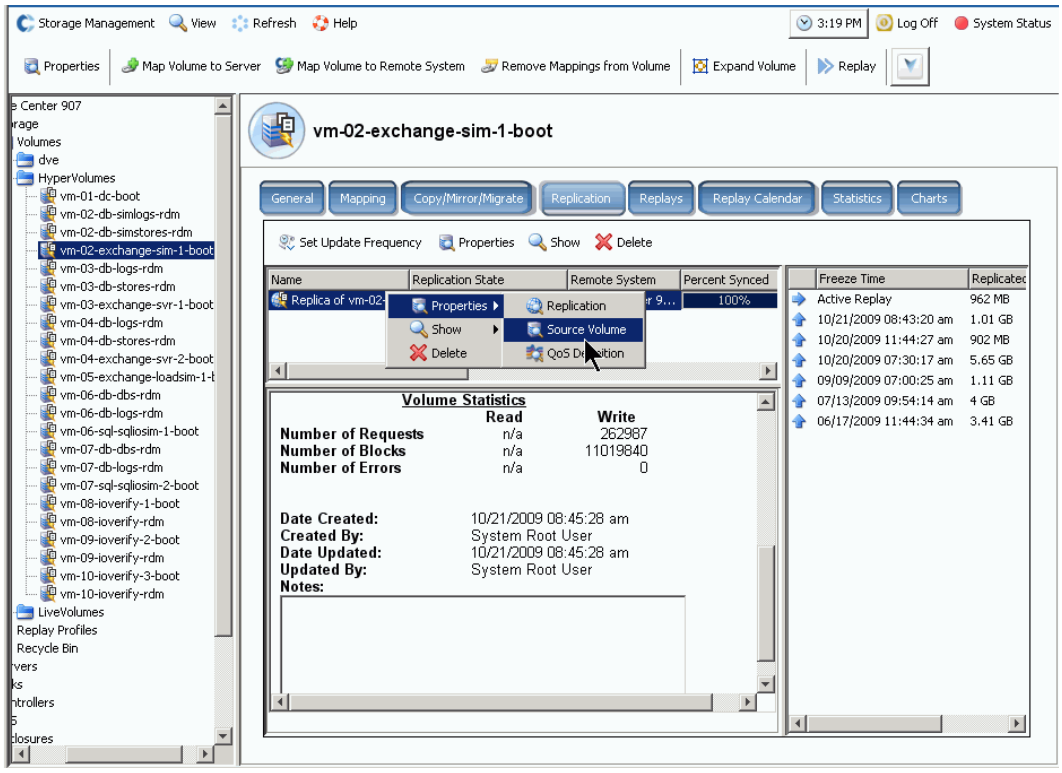


Figure 285. Replication Properties

3 To change Volume properties, refer to Changing Volume Properties on page 87. When you close the window, the Replication is no longer selected. The source volume appears selected in the menu tree.

Viewing Replications

Viewing Asynchronous Replications

From the View menu, choose **Replications**. A list of asynchronous Replications appears.

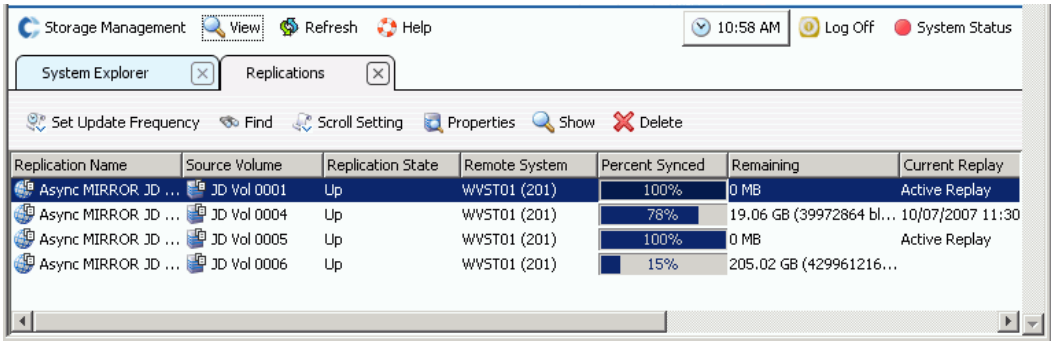


Figure 286. List of Replications

Information displayed includes:

- **Replication Name**
- **Source Volume**
- **Status:** Up or Down
- **Remote System**: System to which the Replication was made
- **Percentage Synced**: Status of the asynchronous Replication as a percentage
- **Remaining**: Amount of data remaining to be synched
- **Current Replay**: Date and time of current Replay being replicated (or active Replay)
- **Active Replay**: Whether or not the active Replay is being replicated
- **Deduplication**: Whether Deduplication is active or not
- **QoS Definition**: Name of definition used by this replication

Note Synchronous Replications appear in the system tree in the same place as the original, replicating volume. Replication properties only appear on volumes that were replicated or are being replicated.

Viewing Replications from a Source Volume

1 In the system tree, select a replication volume. The Volume Information window appears.

2 Click the **Replication** tab. Replication information for that volume appears.

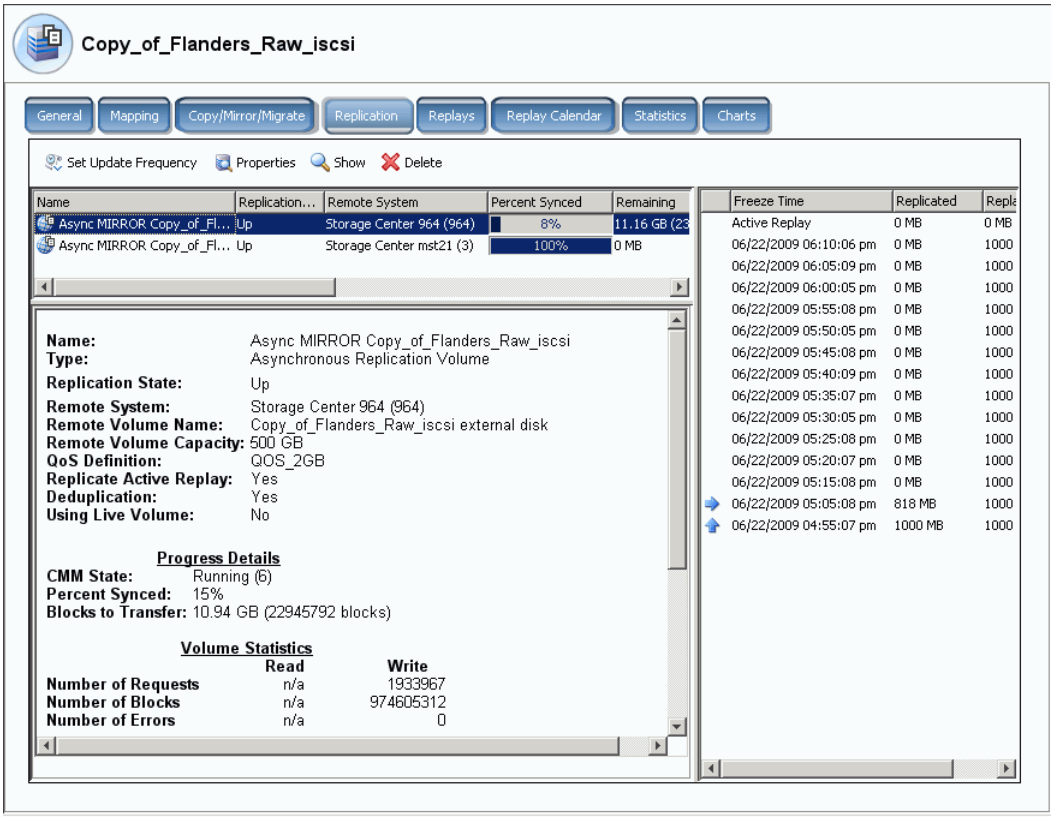


Figure 287. Volume Replication Information

Note The Replication tab appears only if the volume being replicated.

List of Replications

In the top frame, the System Manager displays a list of Replications for this volume. It is being replicated to two different remote systems.

Replication Information

From the list of replications in the top frame, select a Replication. The main window displays information about that Replication

Replication History

In the right frame, the System Manager displays the Replications that were taken of that volume on the Remote system you selected from the List of Replications.

Modifying Replications

In the General Replication Properties window, you can change:

- Name of the Replication
- QoS definition
- Select or clear Replicate Active Replay
- Select or clear Deduplication

To modify Replication properties

1 From the View menu select **Replications**. A list of Replications appears. Select a Replication.

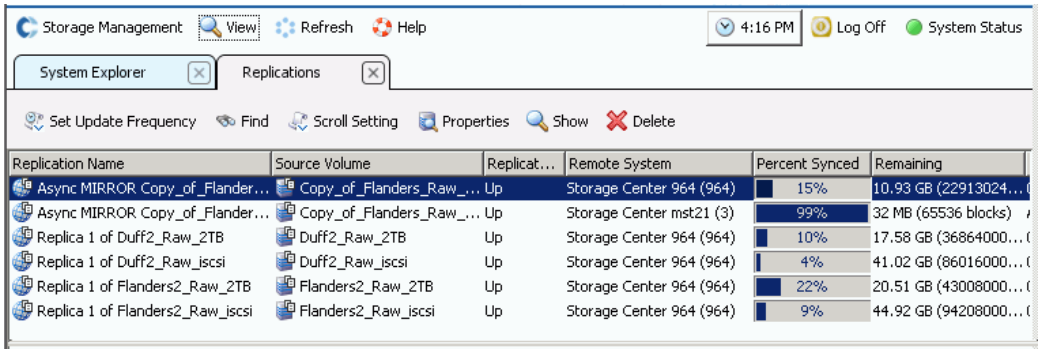


Figure 288. View Replications

2 From the shortcut menu, select **Properties** > **Replications**. The **Volume Properties** window appears.

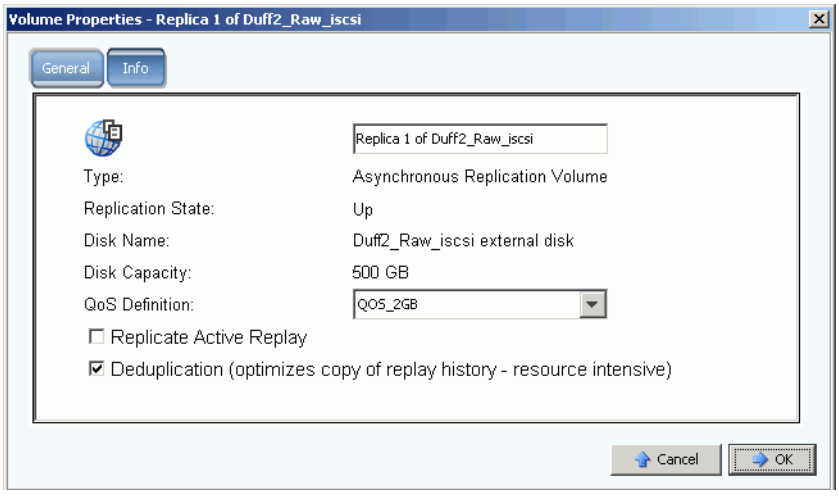


Figure 289. General Replication Properties

3 Make changes.

4 Select **Notes** to add or change notes.

5 Click **OK**.

Re-creating a Volume from a Replication

For information on re-creating a volume from a replication, refer to Recovering Data on page 321.

11 Charting Viewer

Introduction 352
Downloading and Installing Charting Viewer 353
Using Charting Viewer 353
Viewing Storage Center Charts 356
Printing a Chart 357
Printing a Chart 357
Saving a Chart as a PNG Image 358

Introduction

Storage Center Charting Viewer displays real-time IO performance statistics for volumes, servers, disks, and controllers. Charting Viewer is accessible via Enterprise Manager or as a stand-alone application:

- If you are using Enterprise Manager, you can access the Charting View via the Enterprise Manager client. See Using Charting Viewer on page 353.
- If you do not have Enterprise Manager, download and install the stand-alone version of Charting Viewer. See Downloading and Installing Charting Viewer on page 353.

Downloading and Installing Charting Viewer

Charting Viewer Requirements

Storage Center Charting Viewer requires the following:

- Microsoft Windows XP or Microsoft Windows Vista
- Microsoft .NET Framework 2.0 or later
- Java Runtime Environment (JRE) 1.6

Charting Viewer Installation Process

1. Go to the Compellent Customer Portal: http://customer.compellent.com
2. Locate and download the Compellent Charting Viewer Setup file.
3. Double-click on the setup file. The installation wizard appears.
4. Click **Next**. The License Agreement appears.
5. Click **Yes** to accept the license agreement. The installation wizard installs the Charting Viewer.
6. When the installation is complete, click **Finish** to exit the wizard.

Using Charting Viewer

Starting Charting Viewer

The Charting Viewer can be started from Enterprise Manager or as a stand-alone application.

To start Charting Viewer from Enterprise Manager

- Select a Storage Center, and select **View > Charting Viewer**.

To start Charting Viewer as a stand-alone application

1. From the Windows Start menu, select **Compellent Technologies > Compellent Charting Viewer**. The Login dialog appears.
2. Enter the following:
   - **Host Name:** Enter the Storage Center host name for which you want to view charts.
   - **User Name/Password:** Enter the Storage Center user name and password.

Note Only users with Administrator privileges can access and use Charting Viewer.

3. Click **Login**.

Using Charting Viewer Controls

The Charting Viewer provides tool bars for controlling the Charting Viewer display.

- Data Gathering and Navigation Controls
- Charting Report Controls

Data Gathering and Navigation Controls

Use the following buttons to control data gathering and navigation:

Click …	To …
	Page forward in the display.
	Page backwards in the display.
	Select a time increment for the display.
	Start data gathering.
	Stop data gathering.
	Select objects for which to gather information. See Setting Charting Viewer Properties on page 355.
	Update data in all displayed charts.

Charting Report Controls

Use the following buttons to control how Charting Viewer reports are displayed:

Use …	To …
Single Tab	Display all statistics on one tab.
Auto-Scale	Auto-scale the IO, KB, and/or Lat displays. If auto-scale is not selected, enter the scale to use in the charts.
Layout	• For the Storage Center: FE and BE Same. Display Front End (FE) and Back End (BE) in one chart. Deselect to show in different charts. • For individual objects: IO and KB Same. Display IO and KB data in one chart. Deselect to show in different charts.
Display	Select statistics to include or exclude.

Setting Charting Viewer Properties

1 When the Charting Viewer is displayed, click **Properties**. The Charting Properties dialog appears.

2 Select the objects for which you want to gather and display information:

- **Volume IO Usage:** Retrieves and displays IO statistics for all volumes, volume folders, and individual volumes.
- **Server IO Usage:** Retrieves and displays IO statistics for all servers, server folders, and individual servers.
- **Disk IO Usage:** Retrieves and displays IO statistics for all disks, disk folders, and individual disks.
- **Controller/Local Ports IO Usage:** Retrieves and displays IO statistics for all controllers, individual controllers, and individual ports on a controller.

Note Charting Viewer always displays System IO Usage.

3 Click **OK** to close the dialog.

Viewing Storage Center Charts

Charting Viewer provides the following chart types:

- System Charts
- Volume Charts
- Server Charts
- Disk Charts
- Controller/Port Charts

Viewing the System Chart

1. In the Charting Viewer navigation tree, click the **System** icon. The System Chart window appears.
2. Click a tab to view:
   - KB Performance
   - IO Performance
   - System IO Pending

Viewing Volume Charts

1. In the Charting Viewer navigation tree, select the **Volume** icon, a volume folder or an individual volume. The **Volume Chart** window appears.
2. Click a tab to view:
   - Volumes IO
   - Volumes latency
   - Volumes IO Pending

Viewing Server Charts

1. In the Charting Viewer navigation tree, select the **Server** icon, a server folder, an individual server, or an individual port. The **Server Chart** window appears.
2. Click a tab to view:
   - Servers IO
   - Servers Latency

Viewing Disk Charts

To view the disks chart

1. In the Charting Viewer navigation tree, select the disk icon, a disk folder or an individual disk. The **Disk Chart** window appears.
2. Click a tab to view:
   - Disks IO/Latency
   - Disks KB/Latency

Viewing Controller and Local Ports Charts

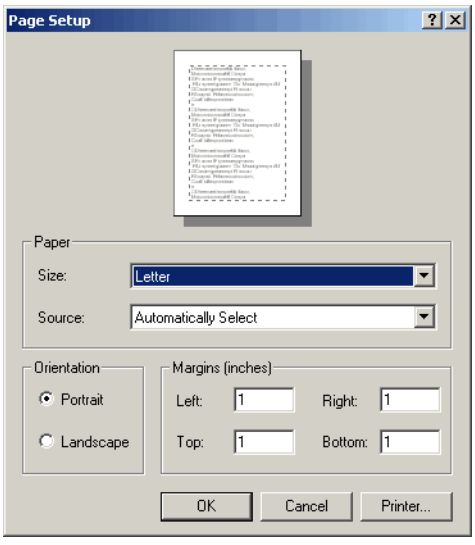
To view the controller and local ports charts

1. In the Charting Viewer navigation tree, select the **Controllers** icon, an individual controller, a port type icon, or an individual port. The **Controller/Ports Chart** window appears.
2. Click a tab to view:
   - Local Ports IO
   - Local Ports Latency
   - CPU/Memory (for controllers only)

Printing a Chart

To print a chart

1. Select the chart you want to print, and select **Print**. The **Page Setup** dialog appears.



2. Select Page Setup options:
   - **Paper Size:** Select a paper size from the list of available options.

- **Paper Source:** Select Automatically Select or Only One.
- **Orientation:** Select Portrait or Landscape.
- **Margins:** Set the left, right, top, and bottom margins.

3 Click **OK**.

Saving a Chart as a PNG Image

1 Select the chart you want to save, and select **Save As**.

2 Browse to and select the directory in which you want to save the chart image, and enter name for the file.

3 Click **OK**.

Zooming In and Out

- Click and drag to define the area you want to view.

To return the chart to default settings:

- Double-click on the chart.

12 Additional Hardware

Introduction 360
Enclosures 360
Removing an Enclosure 371
Uninterruptable Power Supply (UPS) 373
Racks 374

Introduction

Storage Center hardware consists of two functionally and physically separate components: controllers and enclosures. Controllers are described in Controllers on page 141

Enclosures

Viewing All Enclosures

In the system tree, select **Enclosures**. The **Enclosures** window appears.

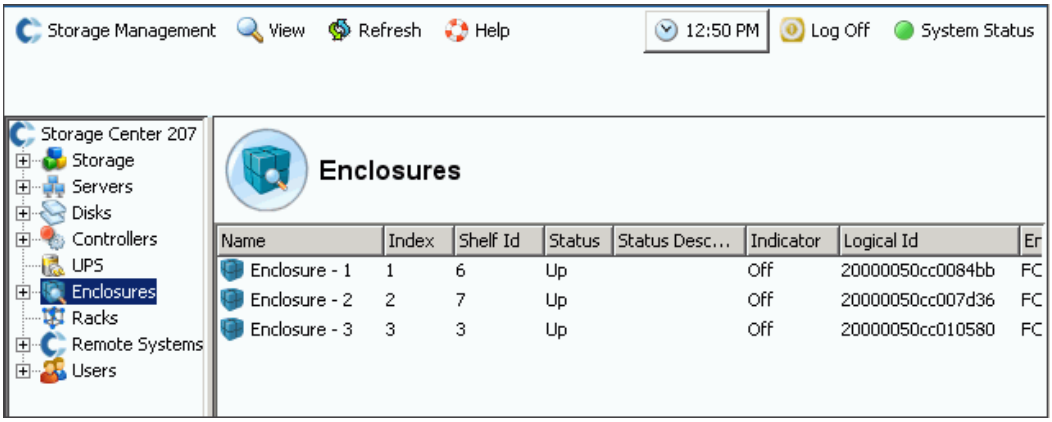


Figure 290. Enclosure Information

Storage Center lists enclosures attached to the Storage Center system with the following information:

- **Name**
- **Index**: Number used by Dell Support Services to assist with component identification.
- **Shelf ID**
- **Status**: **Up** or **Down**
- **Status Description**: frequently blank
- **Indicator**: **On** or **Off**
- **Logical ID**
- **Enclosure type**
- **Model**
- **Revision**
- **A and B Side Firmware**
- If the enclosure is split
- Unrecoverable, critical, and non-critical condition as **Yes** or **No**
- Non-Critical Condition

Viewing General Information for an Enclosure

1 In the system tree, select an enclosure. The **General Enclosure** window appears:

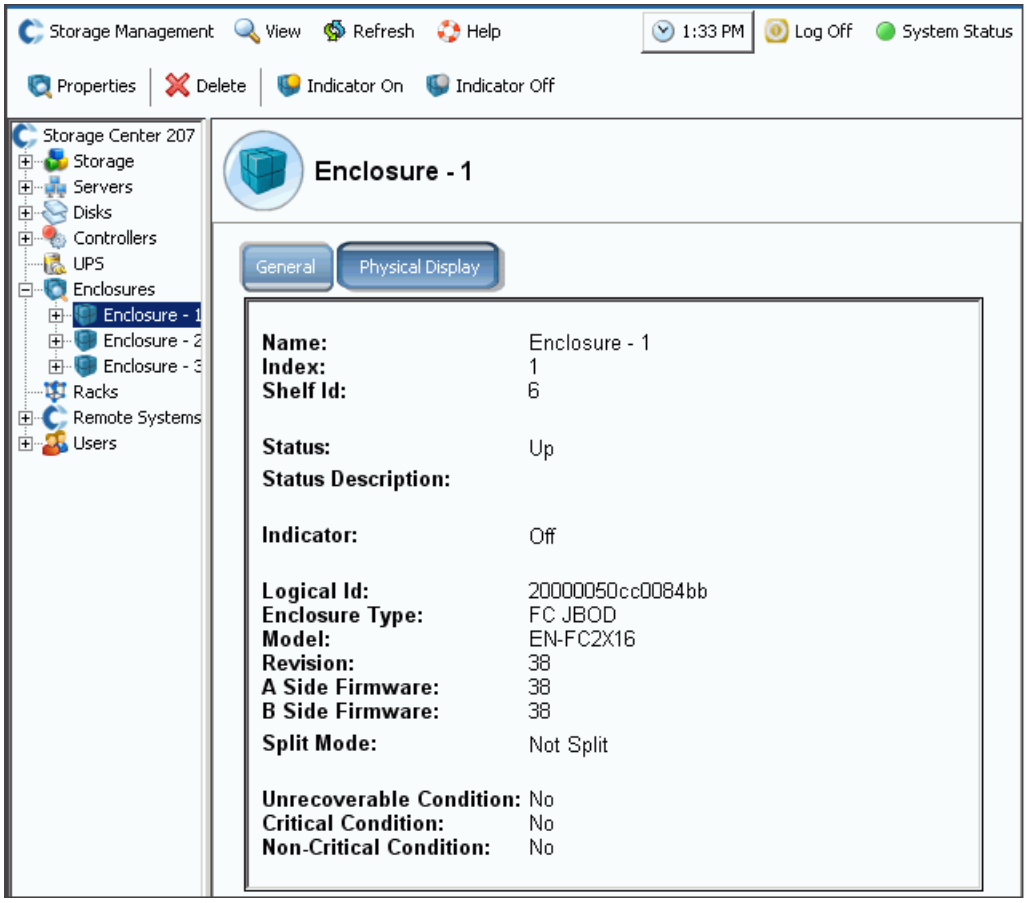


Figure 291. Enclosure General Window

Viewing Enclosure Physical Display

1 In the system tree, select the **Physical Display** tab. A drawing of the enclosure appears.

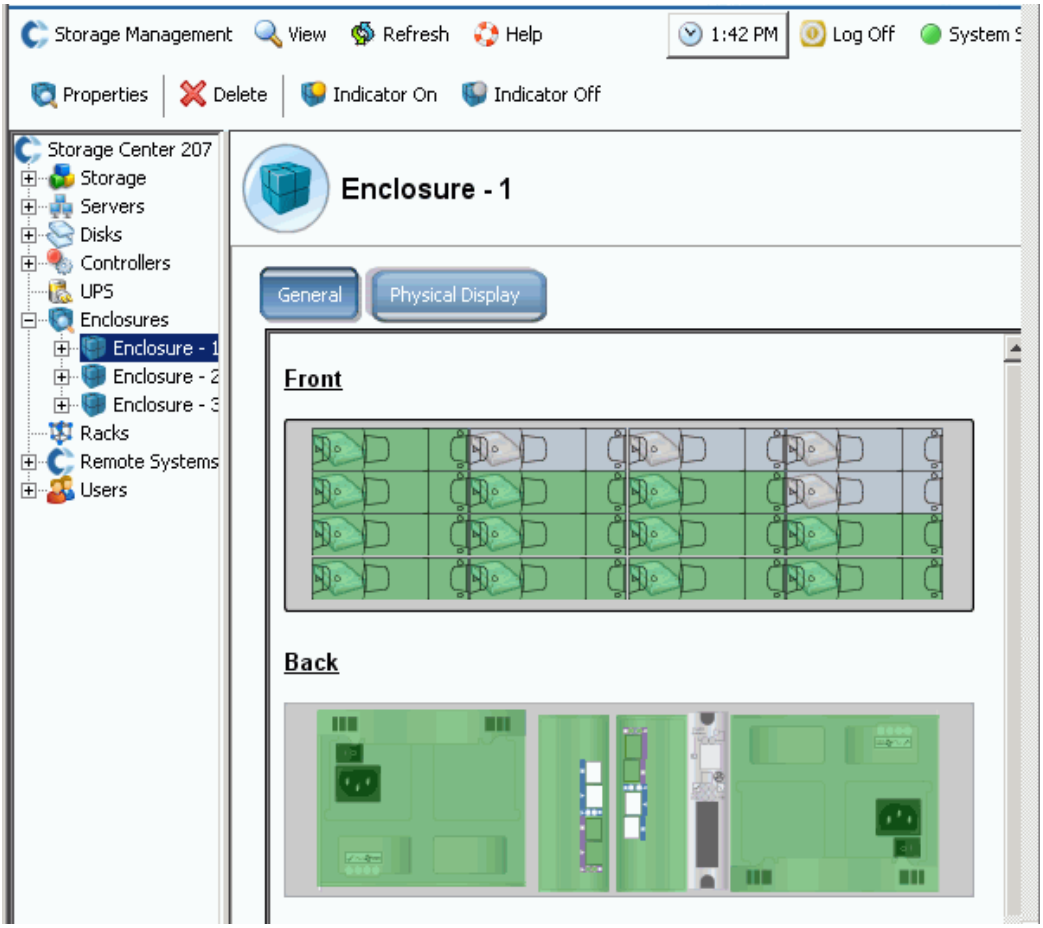


Figure 292. Enclosure Physical Display

To toggle the enclosure indicator light

The Indicator light is a toggle that can be turned on and off. To turn an indicator light on:

1 In the system tree, select an enclosure.

2 From the shortcut menu, select **Indicator On** or **Indicator Off**. (

3 The **Physical Display** window shows that the indicator light is on.

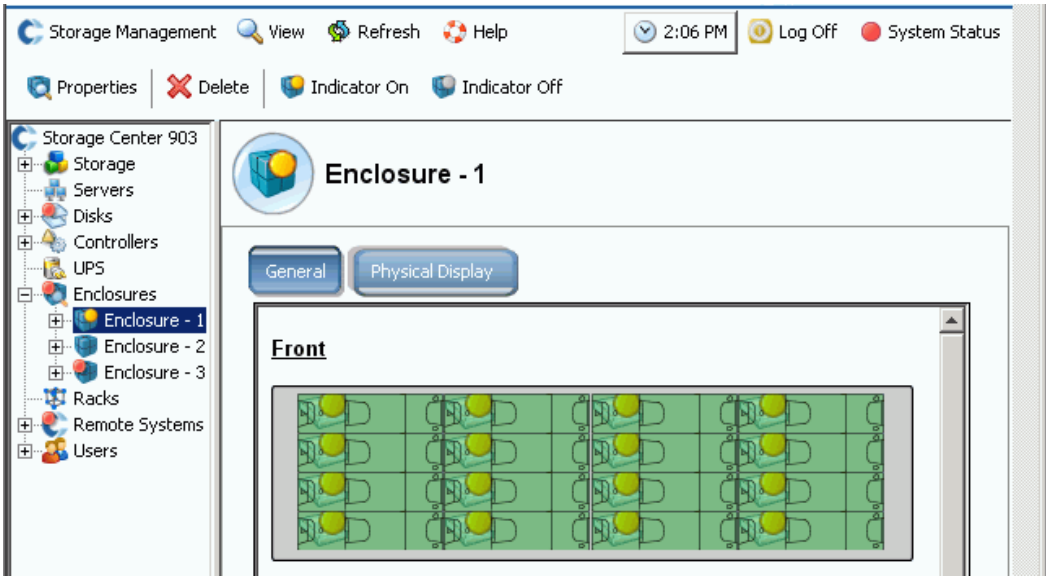


Figure 293. Enclosure Indicator Light On

The enclosure indicator light lights up every disk in the enclosure. To turn the indicator light on just one disk:

1 In the **Enclosures** folder, select a disk.

2 Select the Indicator light. The light on that disk appears.

Renaming an Enclosure

1 In the system tree, select an enclosure.

2 From the shortcut menu, select **Properties**. The **Enclosure Properties** window appears.

3 Enter a name in the **User Alias** field.

4 Click **OK**. The enclosure name is changed.

Removing an Enclosure

Note You cannot remove an active enclosure unless it is down or offline.

1 In the system tree, select an enclosure.

2 From the shortcut menu, select **Delete**. The enclosure is deleted from the system.

Viewing Back End Loops

1 From the **View** menu, select **Enclosure Connectivity**. The following window displaying back end loops appears.

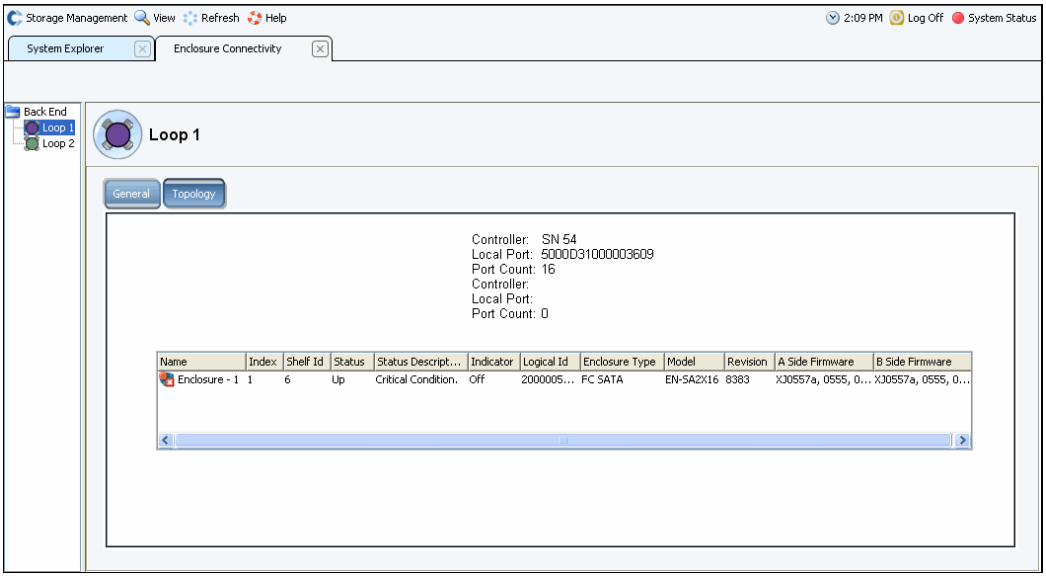


Figure 294. Enclosure Connectivity

For back end loops, the window displays:

- **Enclosure name**
- **Index**
- **Shelf Id**
- **Status**
- **Status Description**
- **Indicator**
- **Logical Id**
- **Enclosure type**
- **Model**
- **Revision**
- **A and B Side Firmware**

2 Click on the **Topology** tab to view a map of the system loops.

To view a single back-end loop

In the enclosure connectivity display, select an individual loop.

Figure 295. Enclosure Connectivity Individual Loop

Scroll to the right to view more information. For each loop, the window displays

- **Name**: of controllers connected to the enclosures.
- **Local port**: for each controller on this loop.
- **Port Count**
- **Loop:** Crossed (True if the loop is crossed. False if the loop is not crossed.
- **Name**: of each enclosure on this loop.
- **Index**: Number used by Dell Support Services to assist with component identification.
- **Shelf ID**
- **Status**: If the status is down, a description of why the enclosure is down.
- **Indicator light:** is **On** or **Off.**
- **Logical ID:** of the enclosure.
- **Enclosure type**: such as an SBOD or JBOD.
- **Enclosure model number**
- **Model revision number**
- **A side firmware**
- **B side firmware**
- **Enclosure**: Split or not

Viewing Physical Disk Status

Note This section deals with physical status of disks. For logical information about disks refer to Disks on page 113.

1 In the system tree, select **Disks**. The System Manager displays a list of the slots in the enclosure.

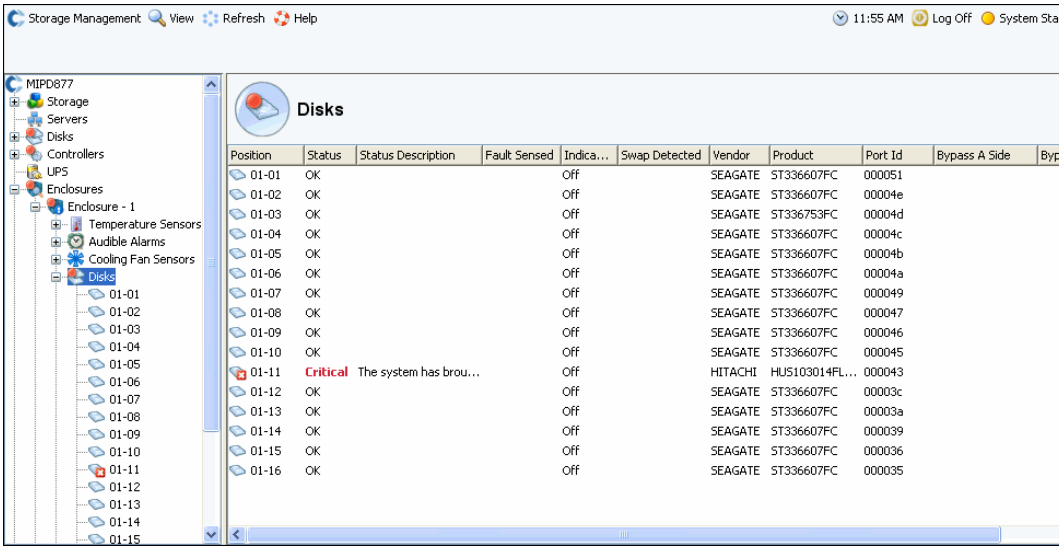


Figure 296. Physical Disk

2 If a slots is empty, the status is **Not Installed**. For disks that Storage Center recognizes, the System Manager displays:

- **Status**
- **Status Description**
- **Fault Sensed**
- **Indicator**
- **Swap Detected**
- **Vendor**
- **Product**
- **Port ID**
- **Bypass A Side**
- **Bypass B Side**

To view status information for a single disk

In the system tree, select a disk. The System Manager displays general status and location. Status can be green (good), red (failed), or gray (no disk).

To identify the physical location of a disk

1 In the system tree, select a disk.

2 From the shortcut menu, select **Indicator On**.

The System Manager displays an amber light on the graphical user interface. Also, the front of the physical drive shows a blinking amber light. To turn the indicator light off:

1 In the system tree, select a disk.

2 From the shortcut menu, select **Indicator Off**.

Viewing Power Supply Status

- In the system tree, select **Power Supplies**.
- To view power supply location as viewed from the back of the enclosure, select a specific power supply.
- If the DC voltage is under a threshold set by the manufacturer, the hardware in the enclosure reports an under-voltage. To clear the flag, select **Request Undervoltage Clear**.

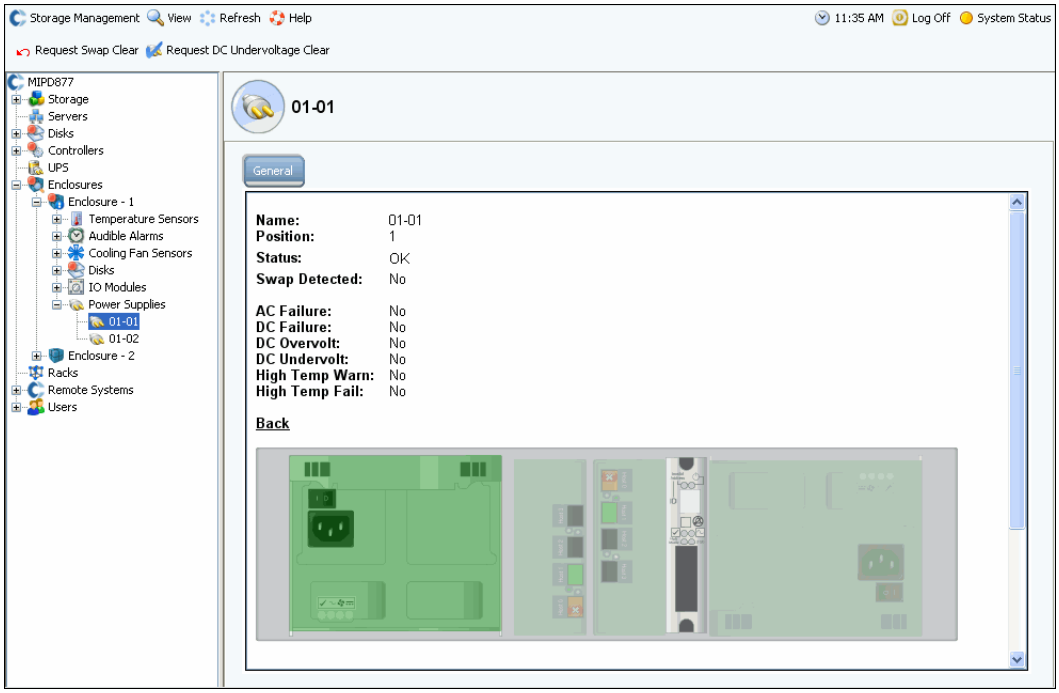


Figure 297. Power Supplies

Viewing IO Module Status

To view IO modules and status

- Select **IO Modules**. The System Manager displays a list of IO modules with name, position, status, and swap detected.
- To view IO module location, select an individual IO module. The IO Module is emphasized in green. If there is a fault, the IO module is red.

Figure 298. IO Module

Viewing Cooling Fan Sensor Status

To view cooling sensor

- Select **Cooling Fan Sensors**. The System Manager displays a list of cooling sensors with the name, position, location, status, fan speed, and swap detected.
- To view fan sensor location, select an individual fan sensor.

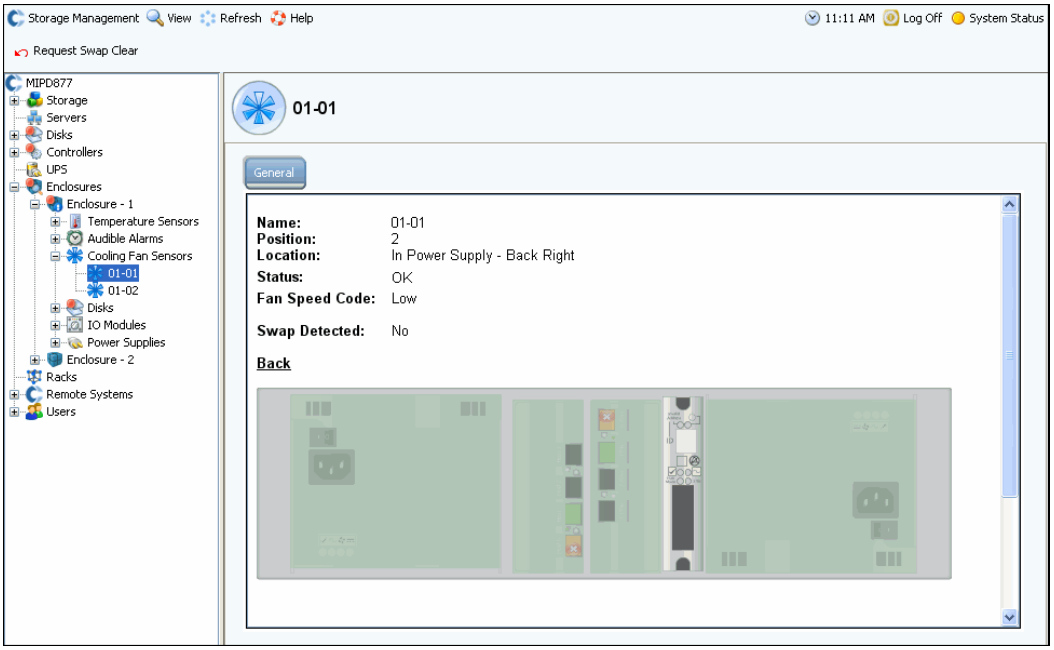


Figure 299. Cooling Fan Sensor

Viewing Temperature Sensor Status

1 To view current temperature range, select a temperature sensor. To clear minimum and maximum temp history, select **Request Min/Max Temps Clear**.

2 Select **Temperature Sensors** to view a list of sensors.

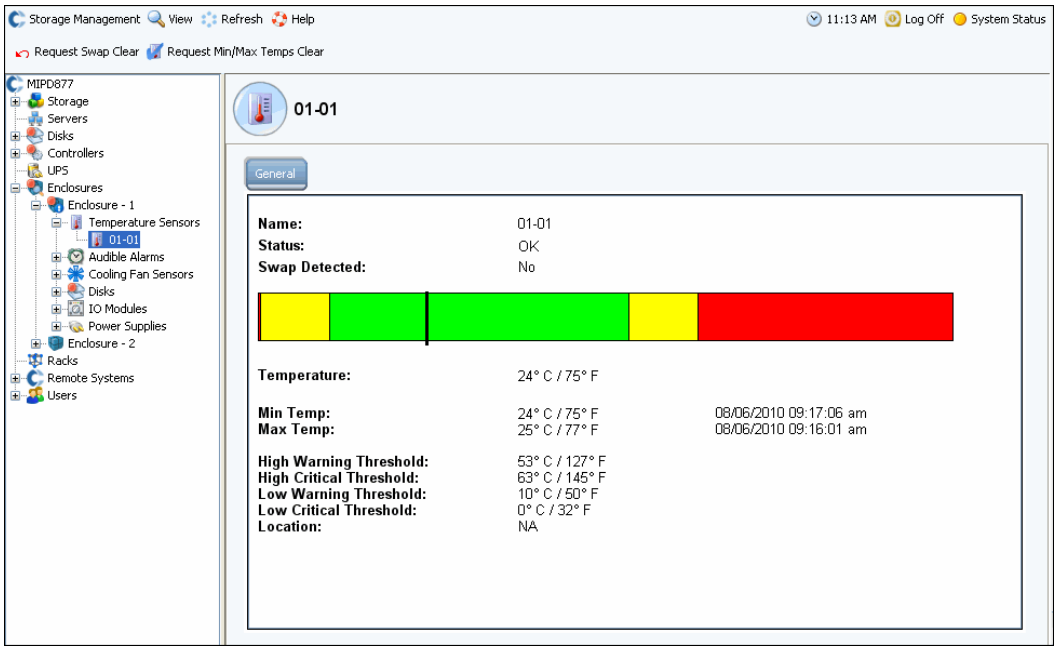


Figure 300. Temperature Sensors

Viewing Audible Alarm Status

To view audible alarms, select **Audible Alarms**. The System Manager displays the audible alarm.

- **Request Mute On:** Causes the alarm to sound if there is a component failure.
- **Request Mute Off:** Mutes the alarm. It will not sound in the event of failure.

Removing an Enclosure

Note An enclosure cannot be taken out of a loop or chain if any of the disks contain data.

1 From the Storage Management menu, select **Disk** > **Folder** > **Create Disk Folder**. Either the system finds unmanaged disks or not:

- If there are unmanaged disks, the System Manager selects the unmanaged disk to be included in the disk folder. Unselect any unmanaged disks. Click **Continue**. The system asks if you still want to create a disk folder without disks. Click **Continue without Disks**.
- If there are no unmanaged disks, the system informs you and asks if you still want to create a disk folder. Click **Yes**.

2 The **Name Disk Folder** window appears. Enter a temporary name or accept the default.

3 Click **Create Now**.

4 In the System Tree, select a logical disk folder that contains the disks in the enclosure you want to remove. Disks are group by RAID level.

5 Click on the **Enclosure** column head to list disks per enclosure.

6 Select all the disks in the enclosure that you want to remove.

7 From the shortcut menu, select **Move Managed Disk**.

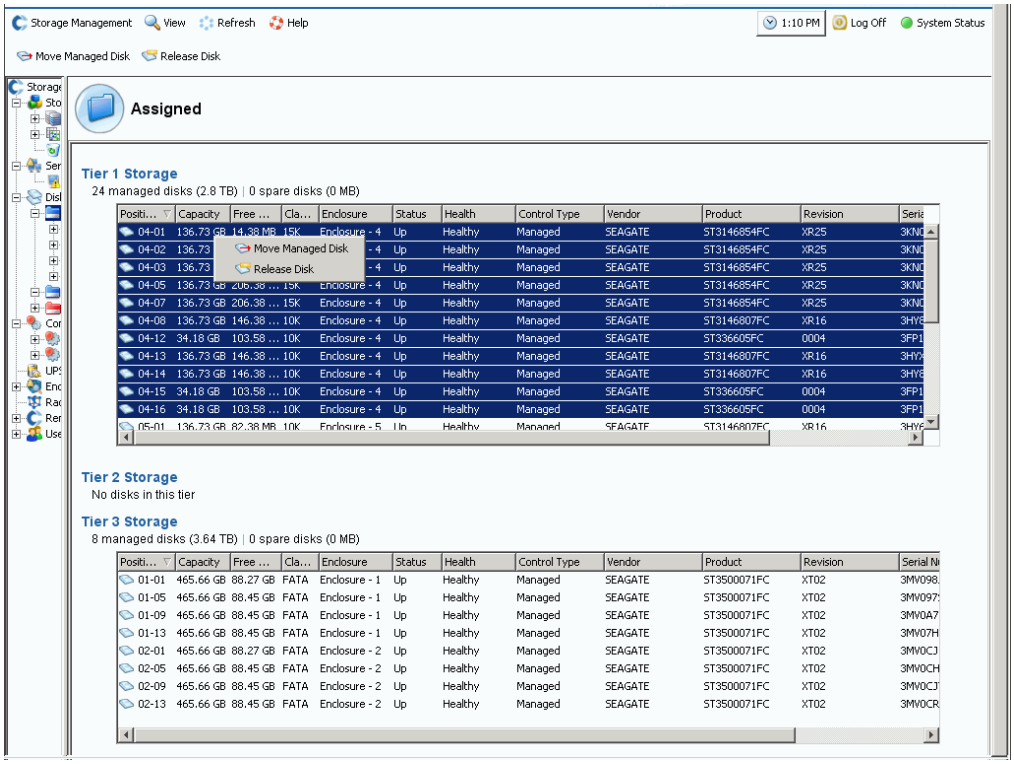


Figure 301. Select Disk Shortcut Menu

Note The **Release Disk** command is not available to disks that have data.

8 The Move Managed Disks window appears with disk folder you created in Step 3 on page 371. Select the new, unmanaged disk folder. Click **Continue**. The system moves the selected disks to the selected disk folder.

9 From the Storage Management menu, select **Disk** > **Rebalance RAID Devices**. The system moves data from the disks in the unmanaged disk folder to disks in the managed disk folder.

10 When the rebalance is complete, in the System Tree, select a disk in the unmanaged disk folder. The system shows that the disk is empty:

- Actual Capacity equals Free Space.
- Total Block Count equals Unallocated Block Count.
- System Allocated Blocks is 0.
- User Allocated Blocks is 0.

The enclosure containing empty disks can now be removed.

Removing a Failing Disk

The procedure for removing a failing disk is similar to the procedure for removing an enclosure (refer to Removing an Enclosure on page 371) except that in Step 6 on page 371, select only the disks you want to remove.

Uninterruptable Power Supply (UPS)

An uninterruptible power supply (UPS), also known as battery back-up, provides emergency power when utility power is not available. A UPS has internal batteries to guarantee that continuous power is provided to the equipment even if the power source stops providing power. Of course the UPS can only provide power for a few minutes, but that is enough to ride out power company glitches or short outages. Even if the outage is longer than the battery lifetime of the UPS, the UPS provides the opportunity to execute an orderly shutdown of the equipment.

Configuring UPS

Before a UPS can be added to the Storage Center, it must be configured to provide data to Storage Center. The procedures for configuring a recommended UPS are described in Configuring a UPS on page 405.

Adding UPS to Storage Center

A universal power supply (UPS) is not a component of the Storage Center system. By adding the UPS IP address to Storage Center, the system reports the status of the UPS. To add the address of a UPS so that Storage Center can report its status:

1. In the system tree, select **UPS**.
2. From the shortcut menu, select **Create New UPS**.
3. Enter the IP address on the network of the UPS to register. You can create up to 16 UPS entries on the Storage Center system for the APC brand of UPS devices.
4. Click **Create Now**.

Viewing UPS Status

To view UPS status, select a UPS.The System Manager displays:

- **Name**
- **IP address**
- **Status**
- **Battery life**
- **Model number**
- **Serial Number**
- **Last Update** (the last time the system polled the device)

Racks

The Rack utility shows the placement of the Storage Center components. The Rack is displays only, but helps to identify the location of components.

Creating a Rack

1 In the system tree, select **Racks**.

2 From the shortcut menu, select **Create New Rack**. The **Create Rack** wizard appears.

3 Enter a name, foreign device URL, and rack size.

4 Click **Continue**. A window appears, listing system components.

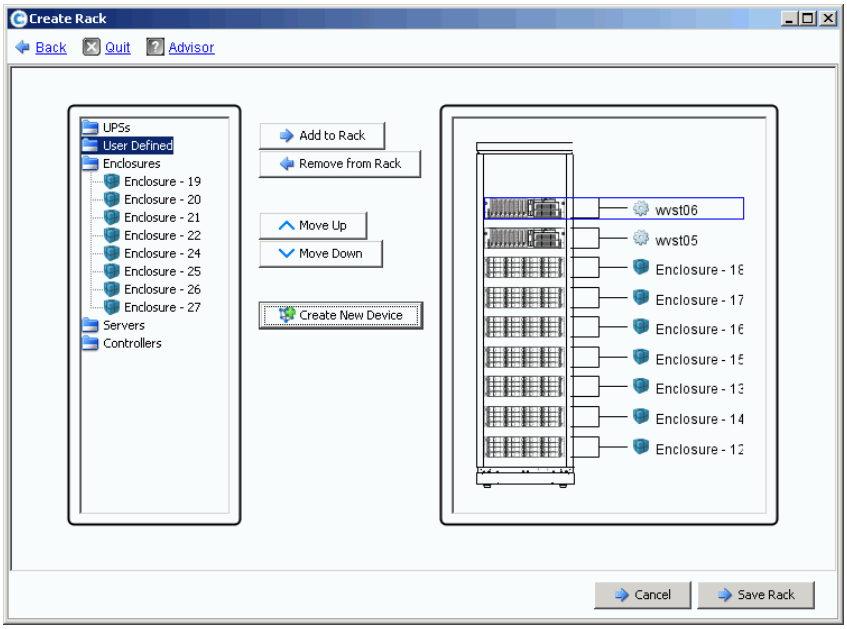


Figure 302. Build Rack

5 Select an item. Click **Add to Rack**. Move the item up or down as required.

6 Click **Save Rack**, or if necessary, select **Create New Device**. The **Create Generic Container** window opens.

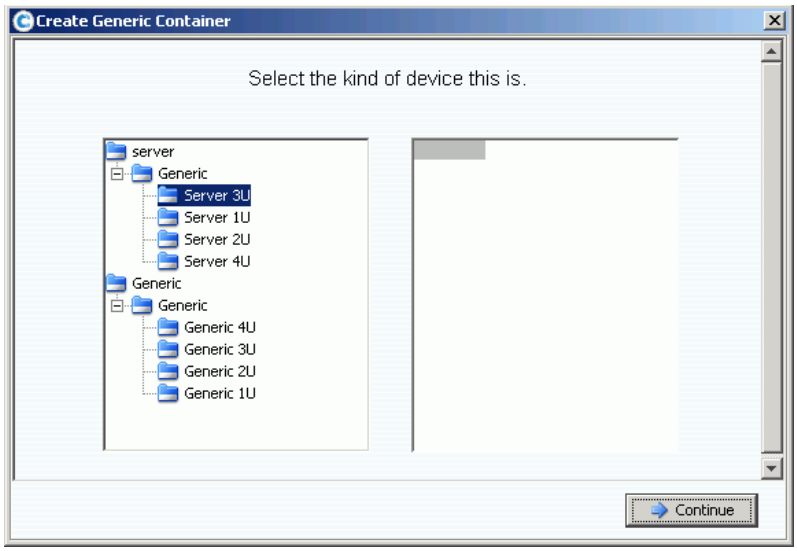


Figure 303. Create Generic Container

7 Select a device of the appropriate size. Remember, you are not creating a device in this window; you are merely creating a picture of a system.

8 Click **Continue**. A window appears listing additional components in your system.

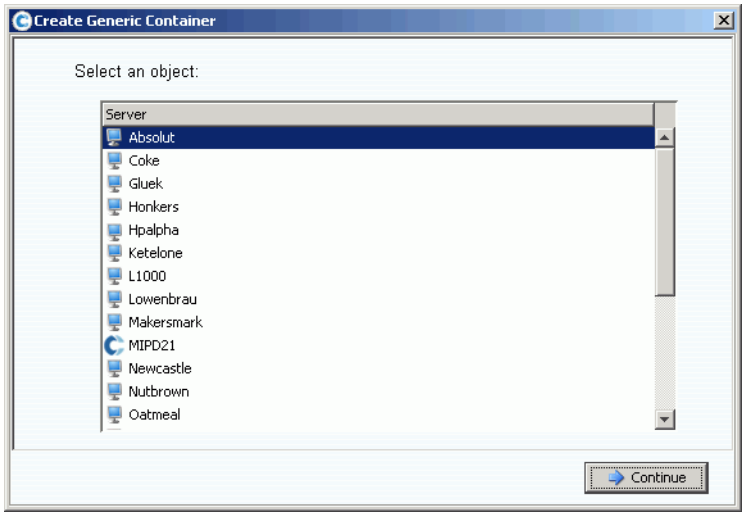


Figure 304. Generic Components

9 Select a component.

10 Click **Continue**. The following window appears.

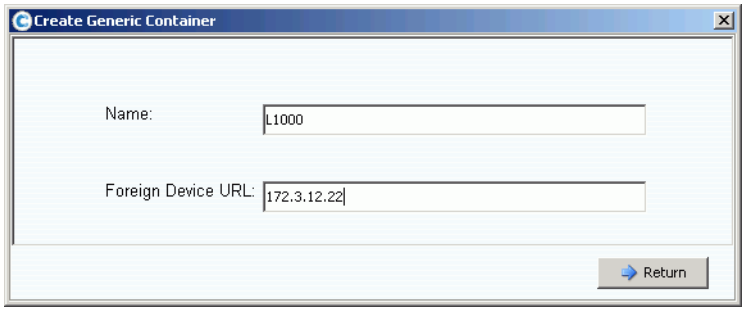


Figure 305. Foreign Device URL or IP Number

11 Enter a URL for the device.

12 Click **Return**.

The new device (in this case, a server) appears in the **Create Rack** window.

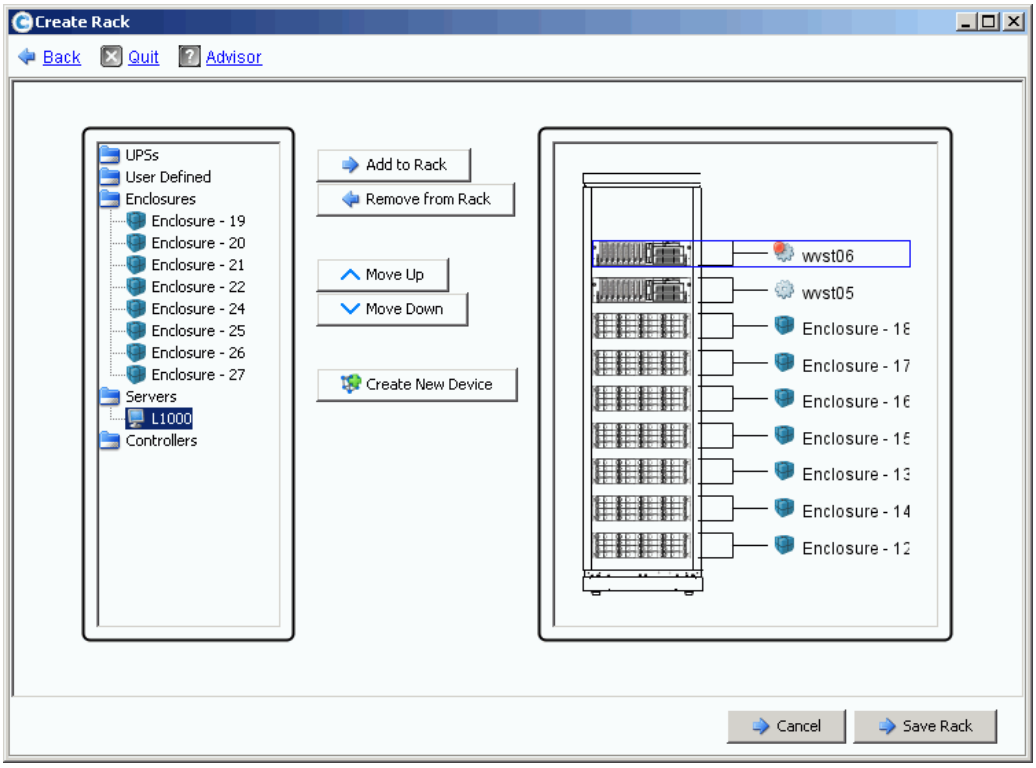


Figure 306. New Device in **Create Rack** Window

13 Add the new device to the rack.

14 Click **Save Rack**. The rack now appears in the system tree.

Adding or Removing Racked Items

1. In the system tree, select **Racks**.
2. From the shortcut menu, select **Add/Remove Racked Items**. The **Add/Remove Racked Items** window appears,.
3. Select components to add or remove. Move items up and down as required. Create a new device as required. When you are through, select **Save Rack**.

Rack Properties

1. In the system tree, select **Racks**.
2. In the shortcut menu, select **Properties**. The System Manager displays the rack name and Foreign Device URL (if this is a foreign device).

Removing a Rack from System Display

1. In the system tree, select **Racks**.
2. From the shortcut menu, select **Remove Rack**. Storage Center asks you to confirm.
3. Click **Yes**.

13 IO Card Changes

I/O Card Change Wizard 380

I/O Card Change Wizard

The IO Card Change Wizard is used to configure IO card hardware changes on a per-port basis after physical IO card changes have been made. The wizard requires Administrator privileges. The wizard can be launched in the following ways:

- The Storage Center will launch the wizard automatically if an IO card change is detected upon startup.
- You can launch the wizard from an Alert generated when an IO card change is detected.
- A separate menu option allows you to launch the wizard at any time. This option is useful when an IO card change cannot be automatically detected by the system; for example, if an IO slot was previously occupied by the same IO card type.

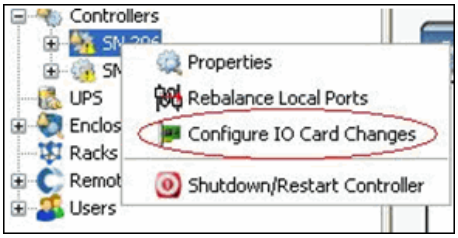


Figure 307. Configure IO Card Changes Menu Option

Note For more information about the IO Card Change Wizard, refer to: *Storage Center 5.4 IO Card Change Wizard* (685-001-001). This document is available only through Dell Support Services.

A Storage Profiles

Overview 382
Changing User Volume Defaults 383
Storage Profiles Created by the System 384
Creating Custom Storage Profiles 385
Managing Storage Profiles 388
Manual Storage Mode 392

Overview

Storage Profiles describe the RAID level and tiers on which data is stored. If disk space is not available within a selected tier, space in other tiers is used until space becomes available in the selected tier. All Storage Centers provide a set of standard Storage Profiles.

- If **Data Progression is licensed**, data can be migrated between RAID levels within a tier and between tiers. The system displays the Recommended Storage Profile to migrate data between tiers. The default Storage Profile for a system with Data Progression is the Recommended Storage Profile
- If **Data Progression is not licensed** and a system uses RAID 10 and RAID 5, data is migrated up or down with in a Tier (drive class) but cannot be migrated between Tiers. If Data Progression is not licensed, a system has access only to Storage Profiles that use a single tier of storage; Storage Profiles with multiple tiers are not available. The default Storage Profile for a system without Data Progression is the High Priority Storage Profile.

The Volume General Tab displays the Storage Profile attached to a volume.

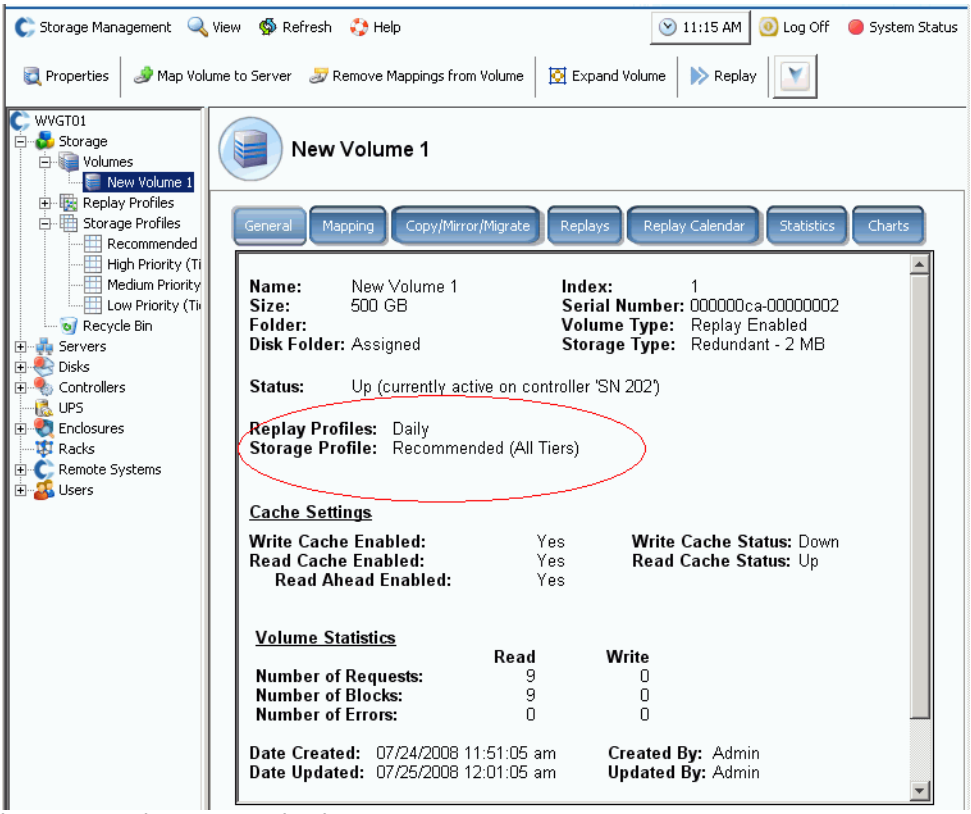


Figure 308. Volume General Tab

Changing User Volume Defaults

By default, Storage Profiles are applied automatically and do not appear in the System Manager. To select Storage Profiles, you must first change User Volume Defaults. User Volume defaults can be changed for:

- You (the current user).
- Other current Administrative or Volume Manager users who are not logged in.
- New users. As new users are created, volume defaults are automatically applied.

Advanced Volume Defaults are the same whether you are setting Volume Defaults for yourself, other users, or new users.

Volume defaults determine options for creating volumes. Configuring volume defaults requires Administrative privileges. Subsequent volumes will be created with these defaults. Existing volumes are not affected.

To manually configure storage profiles when creating volumes

1. From the Storage Management menu, choose **Volume > Configure My Volume Defaults**. The Configure User Volume Defaults window appears.
2. Make sure **Allow User to Modify Preferences** is checked.
3. Click the **Advanced** tab. The Advanced Volume Defaults window appears.

Note If Data Progression is not licensed, the Recommended Profile is not displayed as a choice.

4. Select a Storage Profile that will be used by default when you create a volume. (A default profile can be overridden by choosing a different profile when you create a volume.) If you or another user manually create unique Storage Profiles, those profiles appear as options for creating volumes in the Advanced User Volume Default window.
5. Click **OK**. User volume defaults are set.

Although volumes will be created with the default profile you select in the User Volume Default window, if you allow this user to select a Storage Profile, a list of available profiles appears in the menu tree. Storage Profiles appear only for users whose User Volume Defaults allow them to select a Storage Profile. If a user is not allowed to select a Storage Profile, System Manager applies the default Storage Profile to all new volumes.

Storage Profiles Created by the System

If Data Progression is licensed, cost and performance are optimized when all volumes use the default Recommended Storage Profile. If Data Progression is not licensed, the default Storage Profile is High Priority, which stores data on Tier 1. When Tier 1 is full, data is then stored on the next lower available tier. Without Data Progression, you must configure volumes to use a specific tier of storage. Data will not migrate between tiers.

- To view a list of profiles, expand the Storage Profiles icon.
- To view Storage Profile properties from the list of Storage Profiles, select a profile.

If your user volume defaults allow you to choose a Storage Profile, the System Manager displays default profiles in the system tree under Storage:

- **Recommended** (All Tiers)

  The Recommended Profile is available only when Data Progression is licensed. To optimize Data Progression and performance on the Storage Center, create volumes with the Recommended Storage Profile. The Recommended profile allows the system to automatically progress data between and across all storage tiers based on data type and usage.

- **High Priority** (Tier 1)

  The High Priority Storage Profile provides the highest performance. High Priority limits the data stored on the highest tier of disks. It is efficient in terms of using RAID 5 or 6, but it uses more expensive media to store the data.

  Creating a volume using the High Priority Storage Profile stores written data on Tier 1, RAID 10 (mirrored drives). Replay data is stored on Tier 1, RAID 5/RAID 6. Storage Center does not migrate data to lower storage tiers unless Tier 1 storage becomes full.

- **Medium Priority** (Tier 2)

  The Medium Priority Storage Profile provides a balance between performance and cost efficiency.

  Creating a volume using the Medium Priority Storage Profile stores written data on RAID 10, Tier 2. Replay data is stored on RAID 5/RAID 6, Tier 2. Storage Center does not migrate data to other storage tiers unless Tier 2 storage becomes full.

Note Make sure you have drives actually populating Tier 2 before you create a volume using the Medium Priority Profile.

- **Low Priority** (Tier 3)

  The Low Priority Storage Profile provides the most-cost efficient storage. Creating a volume using the Low Priority Storage Profile stores written data on RAID 10, Tier 3. Replay data is stored on RAID 5/6, Tier 3. Storage Center does not migrate data to higher tiers of storage unless Tier 3 storage becomes full.

Note Make sure you have drives actually populating Tier 3 before you create a volume using the Low Priority Profile.

Creating Custom Storage Profiles

In addition to the standard Storage Profiles provided by the System Manager, you can create custom Storage Profiles.

Upgraded Storage Centers provide the standard set of Storage Profiles, as well as one or more custom profiles created when existing volumes were converted to use Storage Profiles. The custom profiles created by the system can be modified; the standard profiles cannot be modified.

To create a storage profile

1. In the system tree, select the Storage Profiles icon.
2. From the shortcut menu, select **Create Storage Profile**. The Create Storage Profile window appears. Volumes using this profile will use the selected RAID Types and Storage Tiers for writable and replay data. If any storage tiers are configured to use dual redundant storage, the Storage Profile automatically substitutes RAID 10-DM for RAID 10 and RAID 6 for RAID 5 on those tiers. For more information on configuring tiers for dual redundant storage, refer to Configuring Storage on page 120.
3. Select a RAID level and Tier.
4. Click **Continue**. The Name Storage Profile window appears. The default name is based on the RAID level and tiers of this profile. Accept the default or enter a name for the Storage Profile. Enter any notes.
5. Click **Create Now**. Storage Center creates the profile.

You can check or select a tier that is unavailable (non-existent or full). Once disks are added to a tier, Data Progression can take advantage of them.

Creating a Volume Using Storage Profiles

To select a Storage Profile during volume creation or apply a Storage Profile to one or more existing volumes, the **Allow Storage Profile selection** must be enabled in your user volume defaults. Refer to User Volume Defaults - Advanced on page 274.

To create a volume with a storage profile from the menu

1. From the Storage Management menu, select **Create > Volume**. The Create Volume window appears.
2. Enter the size of a volume.
3. Click **Advanced**. The Select Storage Profile window appears, displaying the Storage Profiles available on the Storage Center.

> **Note** The Storage Profiles displayed depends on whether Data Progression is licensed and whether custom profiles have been created on the Storage Center. For information on custom profiles, refer to Creating Custom Storage Profiles on page 385).

4. Select a Storage Profile, and click **Continue**. The Replay Profile window appears.
5. Select one or more Replay Profiles, and click **Continue**. The Name Volume window appears. Enter a name for this volume. Click **Continue**. The system asks you to confirm. Click **OK**.

To create a volume from a server

1. Select a server from the system tree. From the shortcut menu, select **Create Volumes**.
2. Click the **Volumes** tab. The System Manager proposes a volume based your User Volume Defaults.
3. Click **Modify Selected Volume**. The Modify Create Volume window appears.
4. Click the **Change** link next to Storage Profile. The Select Storage Profile window appears.
5. Select a Storage Profile, and click **Continue**. The Modify Create Volume window reappears.
6. Click **Apply Changes**.
7. Click **Create Volume Now**. A volume is created with the Storage Profile you selected.

Applying Profiles to Existing Volumes

To select a Storage Profile when creating a volume or apply a Storage Profile to one or more existing volumes, the **Allow Storage Profile selection** must be enabled in your user volume defaults. Refer to User Volume Defaults - Advanced on page 274.

To apply a storage profile to existing volumes

1. Select a Storage Profile.
2. From the shortcut menu, select **Apply to Volume(s)**. A list of existing volumes appears.
3. Select one or more volumes.
4. Click **Continue**. The System Manager asks you to confirm.
5. Click **Apply Now**. The Storage Profile you select is applied to the volumes you selected. Data will be migrated during the next scheduled Data Progression run.
6. Click **OK**.

To apply a storage profile to an individual volume:

1. Select a volume, and select **Properties**. The Volume Properties window appears.
2. Click the **Storage** tab.
3. Select the Storage Profile for the volume, and click **OK**.

Viewing Volumes Configured with a Storage Profile

1. From the list of Storage Profiles, select a profile. (Remember, the list of Storage Profiles does not appear unless your User Volume Profile allow you to select a Storage Profile. Refer to Changing User Volume Defaults on page 383.) The General Storage Profile window appears.
2. Click on the **Volumes** tab. A list of volumes using this profile appears. The System Manager displays:
   - **Volume name**
   - **Volume Type**
   - **Storage Type**
   - **Disk Folder (**in which the volume resides)
   - **Consumed Disk Space**
   - **Logical Volume Size**

Managing Storage Profiles

1 In the system tree, select Storage.

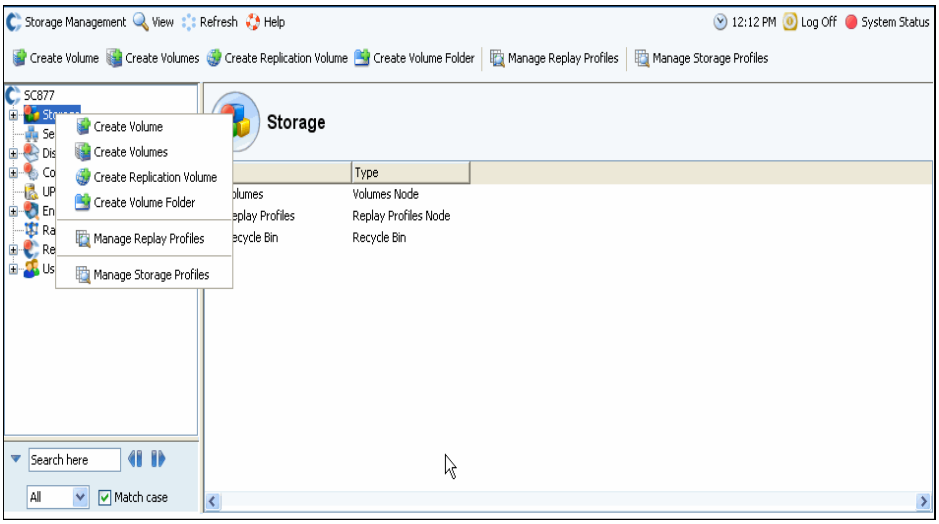


Figure 309. Select Storage in System Tree

2 From the shortcut menu, select Manage Storage Profiles. The Manage Storage Profiles window appears, displaying Storage Profiles for this system.

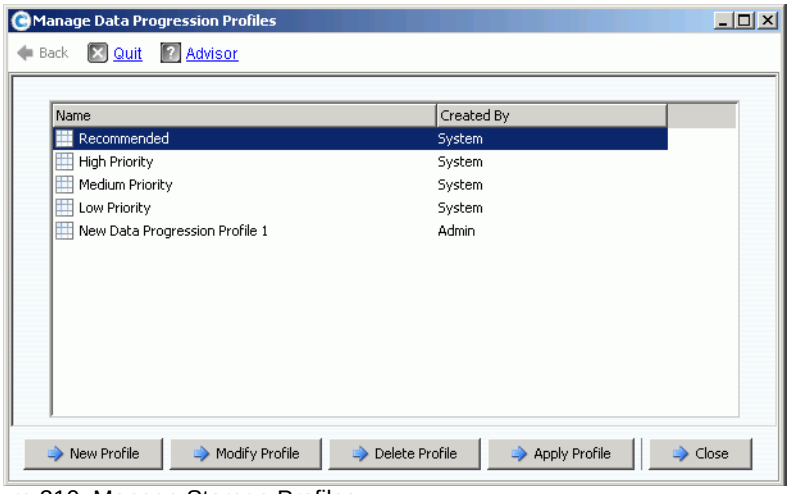


Figure 310. Manage Storage Profiles

The Manage Storage Profiles window allows you to:

- Create a new Storage Profile, described in Creating Custom Storage Profiles on page 385
- Modify a User-Created Profile
- Delete a User-Created Storage Profile
- Apply a Profile to Volumes

Modify a User-Created Profile

Note The standard Storage Profiles packaged with the Storage Center cannot be modified.

1. In the system tree, select a Storage Profile not created by the system.
2. From the shortcut menu, select Modify. (The Modify command is not available for Storage Profiles created by the system.)
3. A window similar to the Create Volume window appears, showing the RAID and Tier setting for this Storage Profile.
4. Select or clear RAID and tier levels.
5. Click **Continue**. The Name window appears.
6. Change the name of the Storage Profile or accept the default.
7. Optionally, add notes.
8. Click **Apply Changes**. The Profile is modified.

Note Changes will be applied to all volumes using this profile. Data will begin to move the next time Data Progression is run.

Delete a User-Created Storage Profile

You cannot delete Storage Profiles that are either:

- Created by the system. To view by whom a Profile is created, select a profile. The General information window displays the creator.
- In use by a volume. To view which volumes, if any, are in use, select a profile. Click the Volumes tab.

To delete a user-created storage profile

1. In the system tree, select a Storage Profile not created by the system.
2. Because you cannot delete a Storage Profile that is being used by a volume, click on the Volumes tab to make sure no volumes are using this Storage Profile.
3. Select the Storage Profile again.
4. From the shortcut menu, select **Delete**.
5. System Manager asks you to confirm.
6. Click **Yes**.

Apply a Profile to Volumes

You can apply a Storage Profile to all volumes, all volumes in a volume group, or selected volumes.

To apply a storage profile

1 Open the Manage Storage Profiles window shown in Figure 310 on page 388.

2 Select a Storage Profile.

3 Click **Apply Profile**. A list of Volumes appears.

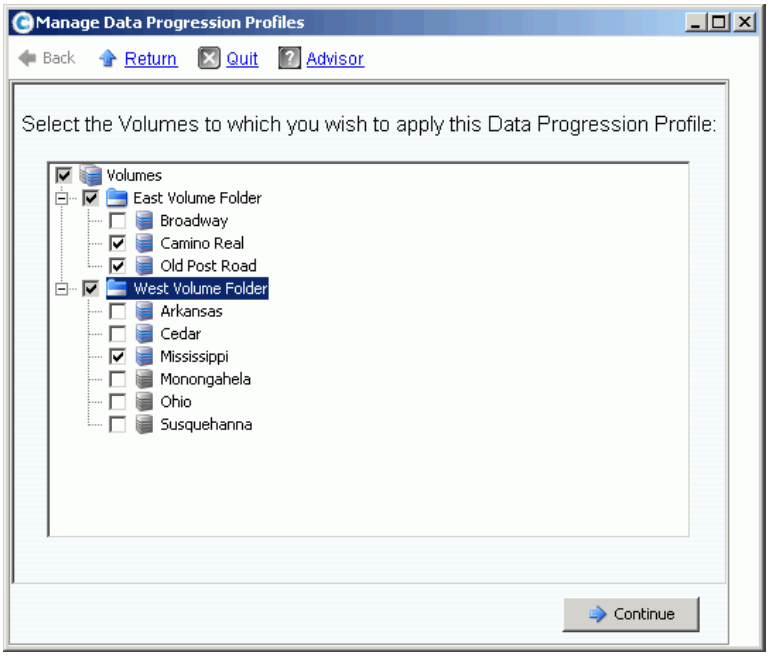


Figure 311. Apply Storage Profiles to Volumes

4 Select one or more volumes or volume groups.

5 Click **Continue**. The system displays the volume and volume folders to which this profile will be applied. Review the list.

6 Click **Apply Now**. The Manage Storage Profiles reappears. Click **Close**.

Changing the Storage Profile Used by a Volume

1 From Storage Profiles list, select a Profile. The General Storage Profile window appears.

2 Click on the **Volumes** tab. A list of volumes using this profile appears.

3 Select one or more volumes.

4 Click **Apply Different Storage Profiles**. The Apply Different Storage Profile window appears listing available profiles.

5 Select a Storage Profile to apply.

6 Click **Continue**. Storage Center asks you to confirm.

7 Click **Apply Now**.

Viewing Volume Statistics

1 In the system tree, select a volume.

2 Click on the Statistics tab. The System Manager displays distribution usage for the volume for each disk tier and RAID selection for a volume. Every time a data progression runs, it categorizes the location of the data in a volume.

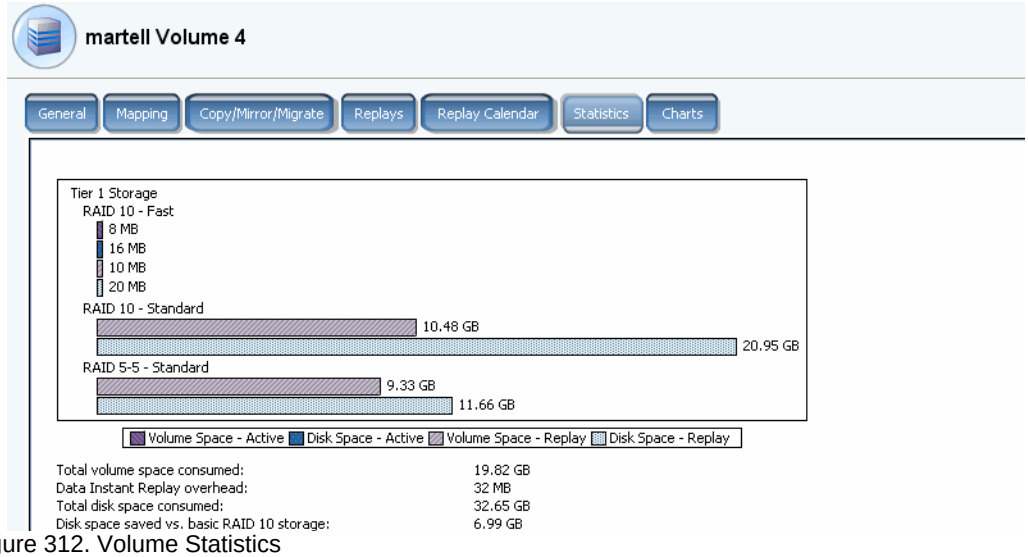


Figure 312. Volume Statistics

Note Because the time it takes to move data depends on the amount of data to be migrated, Data Progression can take a significant amount of time.

Manual Storage Mode

Note Once enabled, manual mode cannot be disabled.

1 From the Storage Management menu, select **System** > **Setup** > **Enable Manual Storage Mode**. A warning window appears.

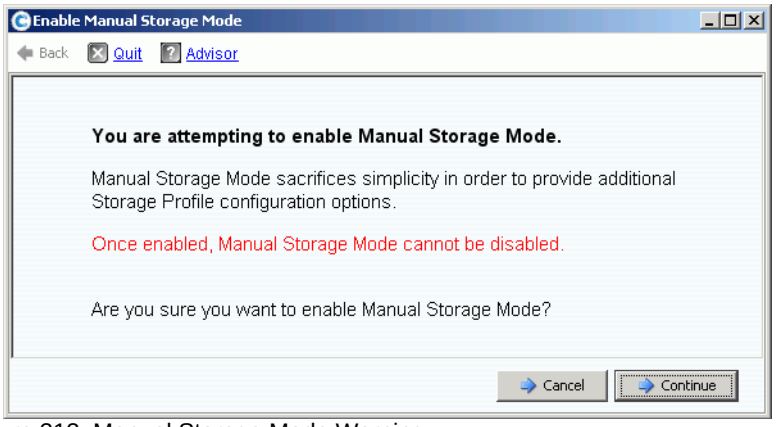

Enable Manual Storage Mode
Back
Quit
Advisor
You are attempting to enable Manual Storage Mode.
Manual Storage Mode sacrifices simplicity in order to provide additional Storage Profile configuration options.
Once enabled, Manual Storage Mode cannot be disabled.
Are you sure you want to enable Manual Storage Mode?
Cancel
Continue

Figure 313. Manual Storage Mode Warning

2 To enable Manual Storage Mode, click **Continue**.

Creating a Storage Profile in Manual Mode

When Manual Storage Mode is enabled, the Create Storage Profile wizard provides selection options for RAID 6 for dual redundant storage.

To create a storage profile in manual mode

1 In the system tree, select the Storage Profiles icon.

2 From the shortcut menu, select **Create Storage Profile**. A window similar to Figure 314 appears.

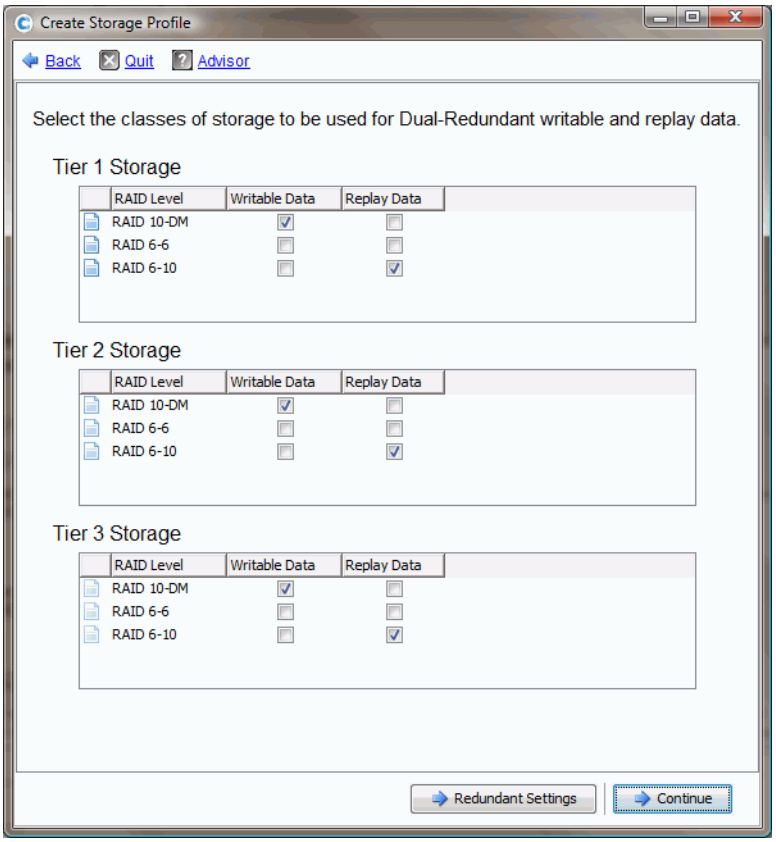


Figure 314. Manual Storage Mode with Dual Redundancy

Note Choices made in the Manual Storage Mode Dual Redundancy window override the stripe width set in System Properties. Refer to Selecting RAID Stripe Width on page 230. Manually creating a Storage Profile is the only way to create exceptions to the stripe width set in System Properties.

3 When RAID levels, tiers, and redundancy (if any) are set, click **Continue**. Storage Center asks you to name the Storage Profile.

4 Enter a name or accept the default.

5 Click **Create Now**.

Viewing a Storage Profile Created in Manual Mode

In contrast to the Storage Profiles created in normal mode, a Storage Profile that is created in Manual Storage Mode displays more detailed information. A Storage Profile created in Manual Mode with Data Progression licensed is shown in Figure 315.

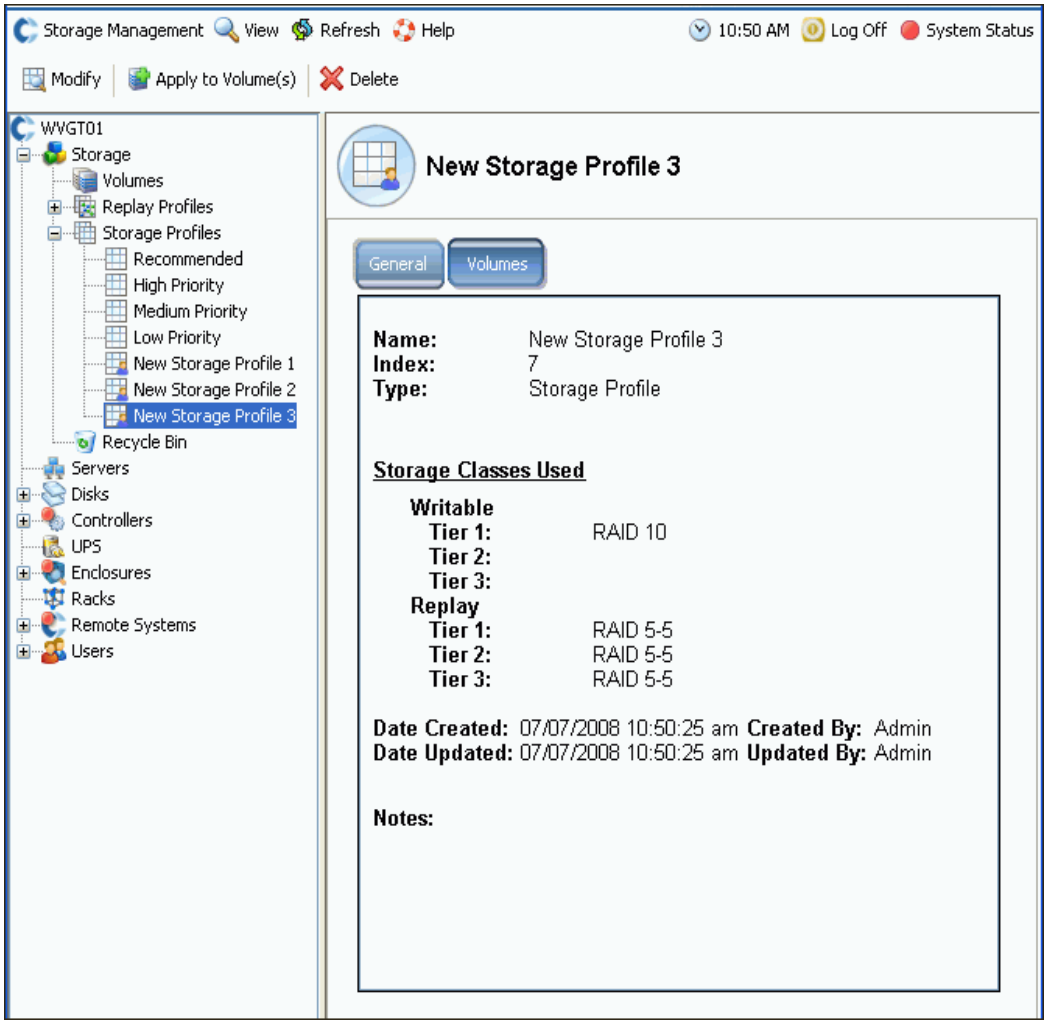


Figure 315. Manual Storage Profile Display

Instead of displaying the writable and Replay tiers used, a Storage Profiles created in Manual mode displays all tiers, including tiers on which data will not be stored using this profile.

Changing RAID Stripe Width in Manual Mode

Once Manual Mode is enabled, the Storage tab in the System Properties window, described in Selecting RAID Stripe Width on page 230, changes to System Storage Properties shown in Figure 316.

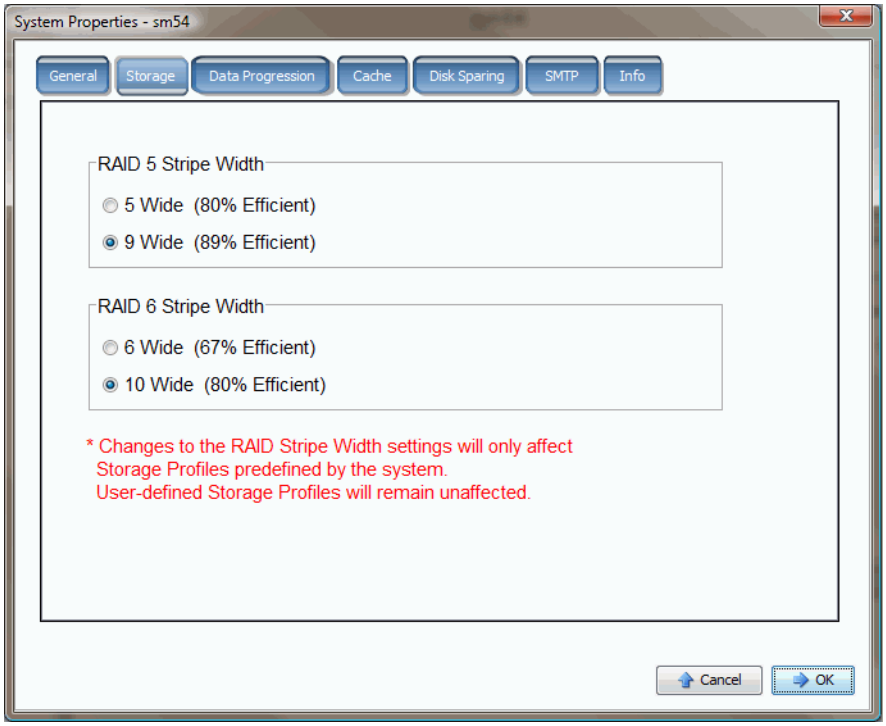


Figure 316. System Storage Properties in Manual Mode

If Manual Storage Mode is enabled and you change RAID stripe width in System Storage Properties, changes only affect Storage Profiles created by the system, not Storage Profiles that were created by users.

B Portable Volume

Introduction 398
List of Portable Volumes 398

Introduction

Enterprise Manager creates and manages portable volumes. Portable volumes allow a site to jump-start the replication of volumes from one Storage Center to another using standard USB disks. For a description of portable volumes, refer to the *Enterprise Manager User Guide.*

Portable volumes are set up and managed via the Enterprise Manager Storage Management display. For more information, refer to the *Enterprise Manager User Guide*. Once a portable volume is created, the Portable Volume node appears if Storage Center is licensed for Remote Instant Replay and any of the following exist:

- USB disk is connected to the Storage Center
- Data was copied to a portable volume
- A volume was or is waiting to be restored from a portable volume

List of Portable Volumes

To view a list of portable volumes

In the System tree, select **Portable Volume**. The system displays a list of portable volumes.

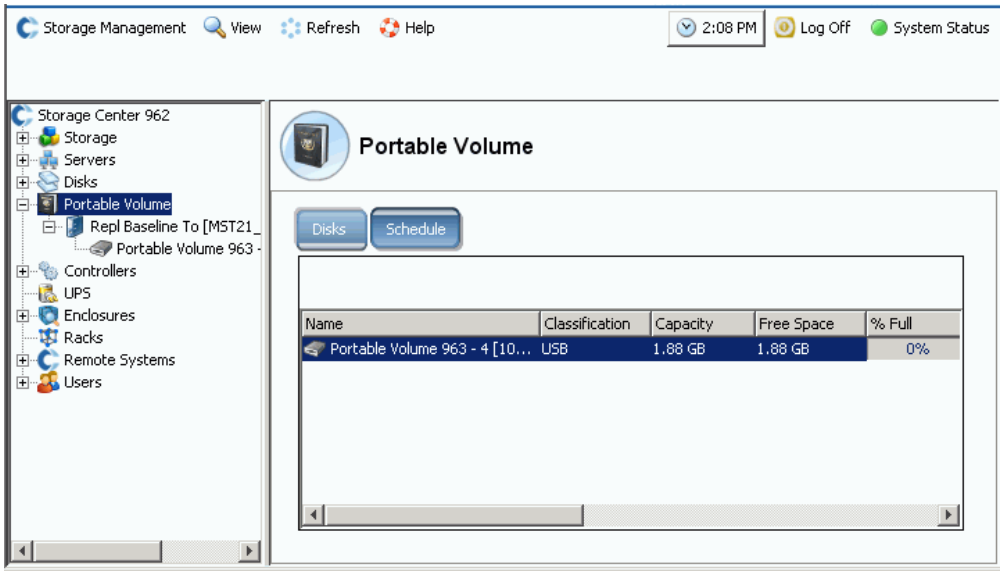


Figure 317. List of Portable Volumes

Portable Volumes Nodes

Portable Volume Node	Description
Unassigned	Shows USB disks on the Storage Center that are currently unassigned.
Repl Baseline To [dest]	Shows USB disks on the Storage Center that contain baseline replications for which the Storage Center is the source.
Repl Baseline From [source]	Shows USB disks on the Storage Center that contain baseline replications for which the Storage Center is the destination.
Invalid	Shows USB disks on the Storage Center that contain replications for which the Storage Center is neither the source or destination of the replications.
Being Erased	Shows USB disks on the Storage Center that are currently being erased.

C Enterprise Solid State Drives

Overview 402

Installation and Setup 403

Overview

Introduction

Storage Center supports Enterprise Solid State Drives (ESSD) with a capacity of 146 GB. Use ESSDs for volume data that requires drastically reduced latency and/or increased IP.

For maximum IO per seconds, we recommend sites install two SBOD enclosures with two ESSDs in each. That is, do not install all ESSDs in the same SBOD enclosure.

Requirements

A site implementing ESSDs must meet the following requirements:

Requirement	Description
Enclosure Type and Slot Restrictions	• Enclosure Type—4Gbps SBOD Enclosure • Enclosure Firmware—Level 0808 or higher • Enclosure ESSD Slot Positions—Within the enclosure, ESSDs can be positioned in slots 2 thru 15.
Fiber Channel Drives	• Enclosure slots 1 and 16 must be populated with Fiber Channel drives.
RAID Levels	• RAID 10 Dual Mirror A minimum of three ESSD data disks and one ESSD hot spare • RAID 10 A minimum of two ESSD data disks and one ESSD hot spare. • RAID 6-6 A minimum of six ESSD data disks and one ESSD hot spare • RAID 5-5 A minimum of five ESSD data disks and one ESSD hot spare. • RAID 5-9 A minimum of nine ESSD data disks and one ESSD hot spare. • RAID 6-10 A minimum of ten ESSD data disks and one ESSD hot spare

Storage Tiers and Storage Profiles

After installation, ESSDs are automatically assigned to Storage Tier 1 and all other available disks classes are moved down to a lower tier. The following tables show how the Storage Tiers and corresponding disk classes are re-assigned after adding ESSDs to a Storage Center:

Storage Tier	Existing Disk Type	Disk Type After ESSD Install
Tier 1	15K	ESSD
Tier 2	10K	15K, 10K
Tier 3	7K	7K

Storage Tier	Existing Disk Type	Disk Type After ESSD Install
Tier 1	15K	ESSD
Tier 2	7K	15K
Tier 3	7K	7K

Storage Tier	Existing Disk Type	Disk Type After ESSD Install
Tier 1	15K	ESSD
Tier 2		15K
Tier 3	10K	10K

Tier	Existing Disk Type	Disk Type After ESSD Install
Tier 1	10K	ESSD
Tier 2	7K	10K
Tier 3	7K	7K

System-provided Storage Profiles that use Storage Tier 1 (**Recommended** or **High**), automatically allow associated volumes to use the ESSDs. See Configuring Storage Profiles on page 404 for details on configuring Storage Profiles to make the best use of ESSD storage.

Installation and Setup

Installing the Hardware

Enterprise Solid State Drives (ESSDs) are allowed in slots 2 thru 15 of an SBOD enclosure (up to 14 per enclosure). In addition, slots 1 and 16 must contain fiber channel drives. For maximum IOs per second, use two SBOD enclosures with two ESSDs each.

For details on inserting drives into enclosures, see the *Storage Center System Setup Guide*. For details on installing SBOD enclosures, see the *Storage Center System Connectivity Guide*.

Configuring Storage Profiles

Because ESSDs are automatically assigned to Storage Tier 1 after installation (see Storage Tiers and Storage Profiles on page 403), the system-provided profiles that include Storage Tier 1 allow volumes to use ESSD storage:

- On Storage Centers without licensed Data Progression, the system-provided High profile includes ESSDs. Make sure only volumes you want to use ESSDs are assigned to the High profile; reassign all other volumes to either the Medium or Low profiles.
- On Storage Centers with licensed Data Progression, the system-provided Recommended profile includes ESSDs. Make sure only volumes you want to use ESSDs are assigned the Recommended profile. Create and apply a new profile that does not include Storage Tier 1 for all other volumes.

For information on creating Storage Profiles, see Creating Custom Storage Profiles on page 385; for information on applying profiles to existing volumes, see Applying Profiles to Existing Volumes on page 387.

Automatically Progressing Data to ESSDs

After you have finished re-configuring the Storage Center Storage Profiles and installed ESSDs, the Storage Center automatically progresses data from the disks in the old Storage Tier 1 to the ESSDs in the new Storage Tier 1. The automatic Data Progression requires approximately four days to complete.

Note Do not adjust Data Progression settings to speed up progressing data to ESSDs. To accelerate the progression of data to ESSDs, use CMS to copy and swap the volumes.

Disabling Write Cache

To maximize performance, disable write cache on volumes that use ESSDs.

1. Select the volume, then click **Properties**. The Volume Properties window appears.
2. Select the **Cache** tab.
3. Uncheck the box next to **Enable Write Cache**
4. Click **OK**.

Replays

Replays are an important requirement for efficient Data Progression. For the most efficient use of ESSD, Replays should be taken at least once per day. For more information on Storage Center Replays, see Expiring a Replay Explicitly on page 312.

D Configuring a UPS

Configuring an APC™ UPS 406
Configuring a Liebert™ UPS 411

Introduction

This appendix describes setting up a UPS. For a dual controller, connect to the actual IP address of a each controller. The management IP of a dual controller is used for traps.

Configuring an APC™ UPS

You can configure up to four access control entries to specify which Network Management Systems (NMS) have access to this UPS.

To configure APC UPS

1 In a new browser window, enter the **IP address** of the UPS, assigned or derived from DHCP. The UPS Network Management card appears.

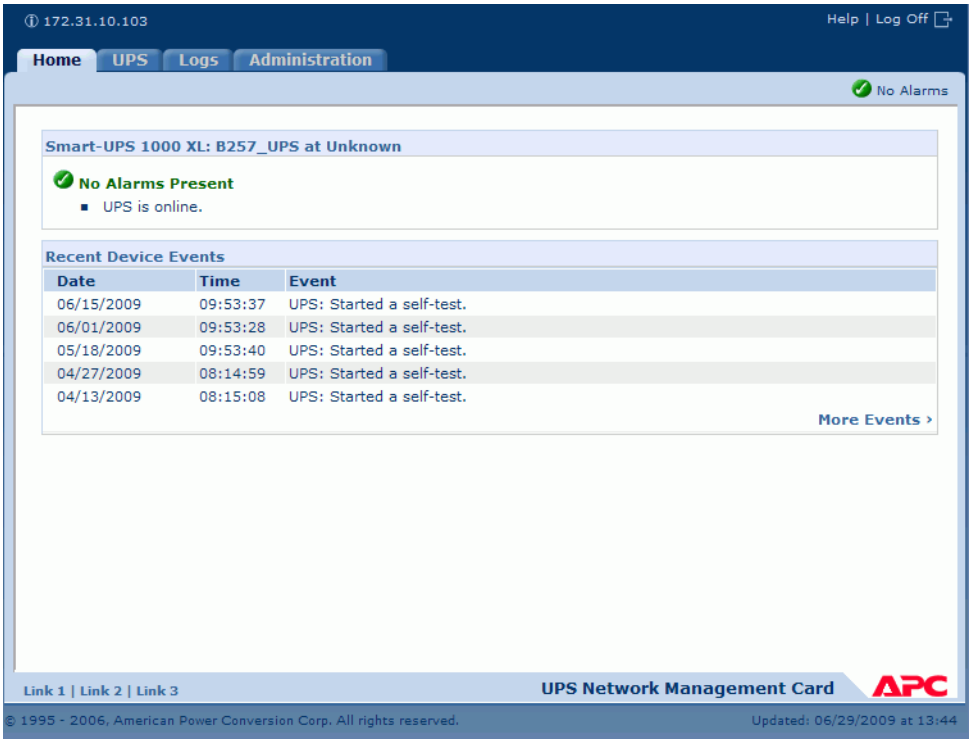


Figure 318. APC UPS Network Management Card

2 Click the **Administration** tab.

The Administration window appears.

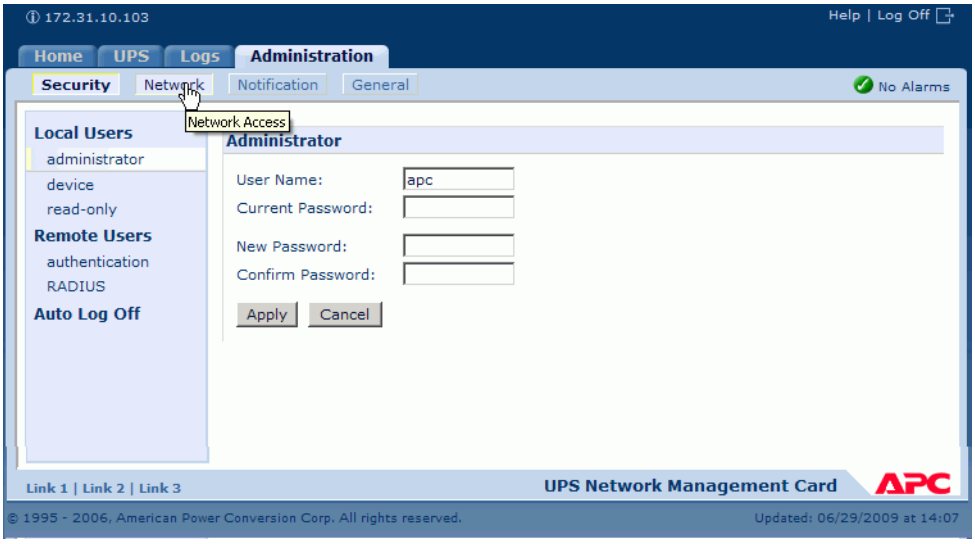


Figure 319. APC Administration Window

3 In the Administration window, click **Network**. The Administration > Network window appears.

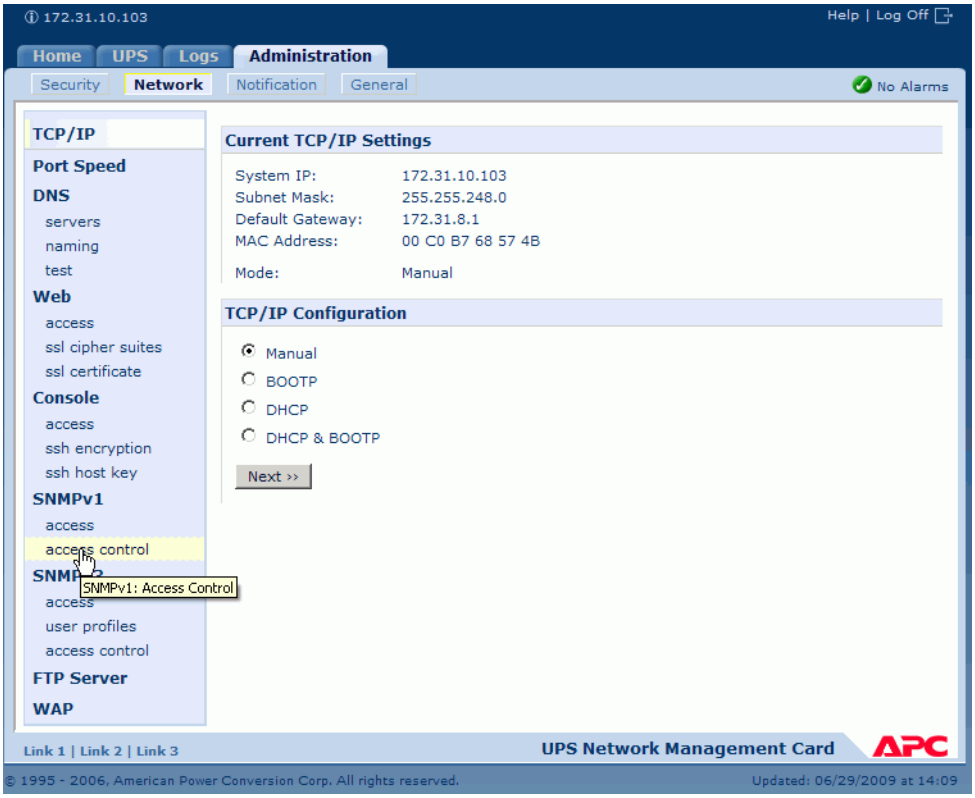


Figure 320. Administration Network Window

4 In the TCP/IP menu on the left side, select **SNMPv1** > **Access Control**. The Access Control window appears.

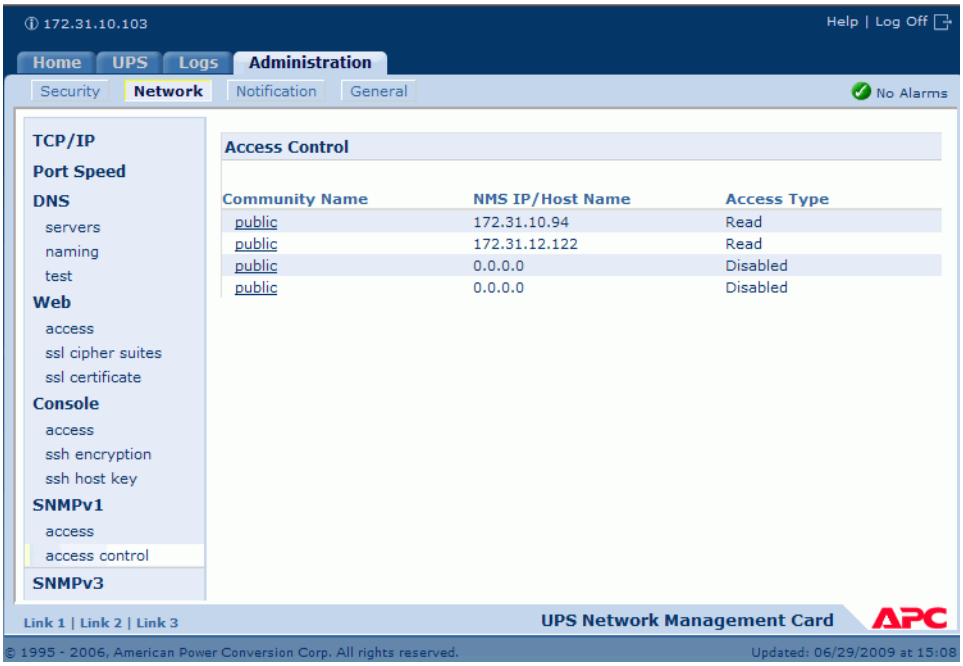


Figure 321. Access Control Window

5 Select **Public**. The Access Control Entry windows appears.

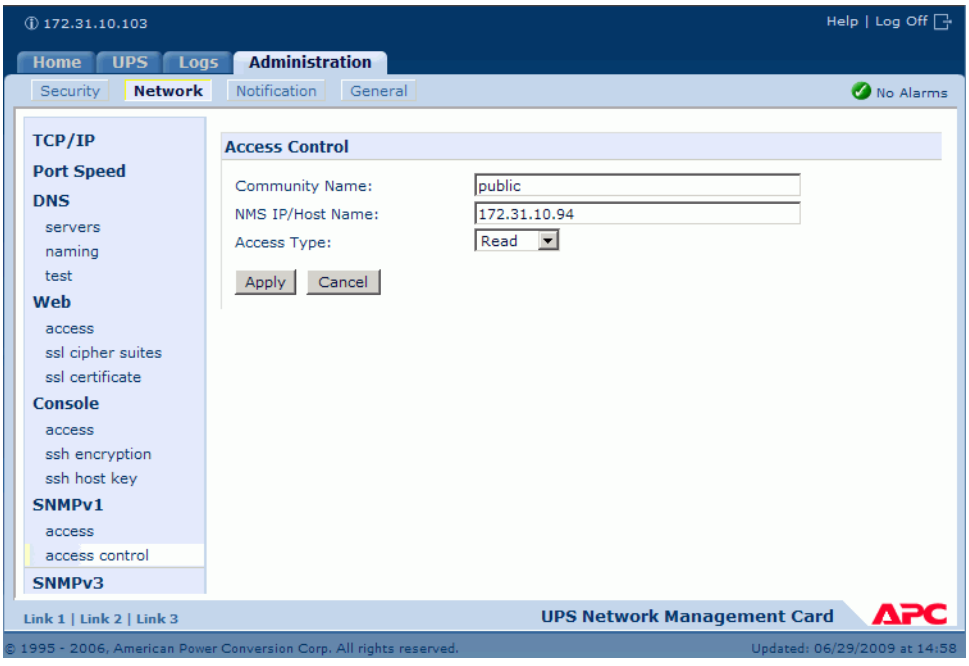


Figure 322. Access Control Entry Window

6 For a single-controller Storage Center, in the Access Control Entry window, enter the controller IP address in the Access Control Entry window. (Refer to Viewing Controller Properties on page 144.)

7 As an Access Type, select **Read**.

8 Click **Apply**.

9 Add the actual IP address of the clustered controller (not the management IP address).

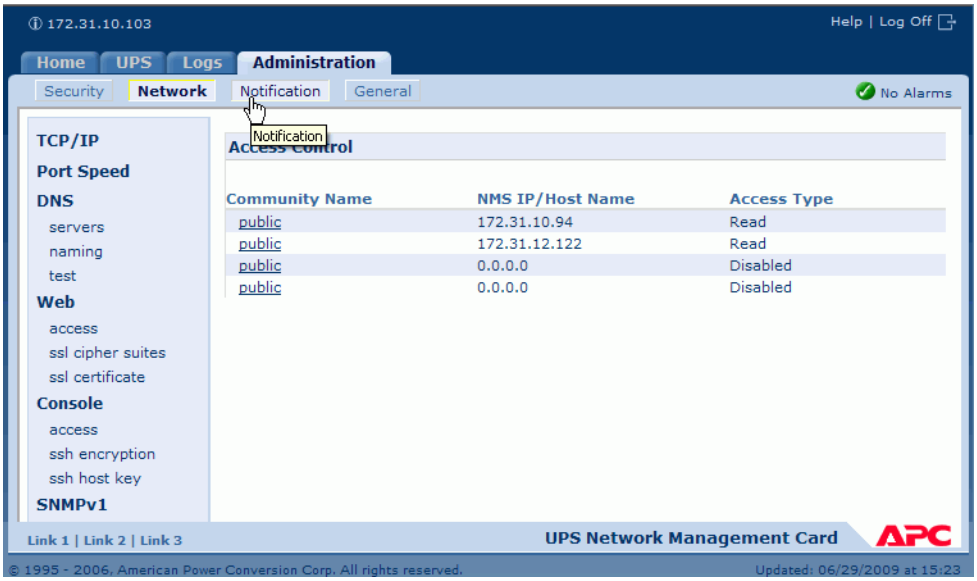


Figure 323. Addresses Entered

10 In the Access Control window, select **Notification**. The Notification window appears.

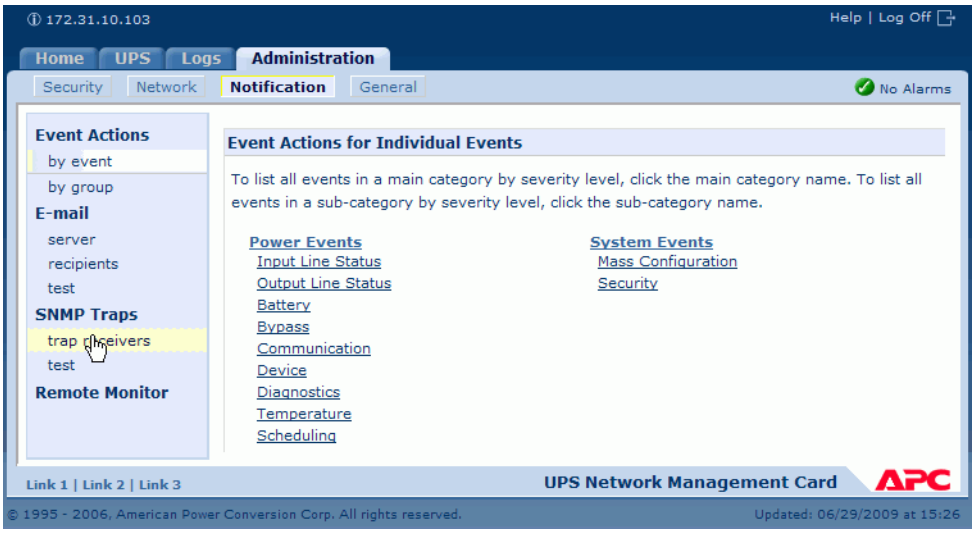


Figure 324. APC Notification Window

11 In the Notification window, select **trap receivers**.

The Trap Receivers window appears.

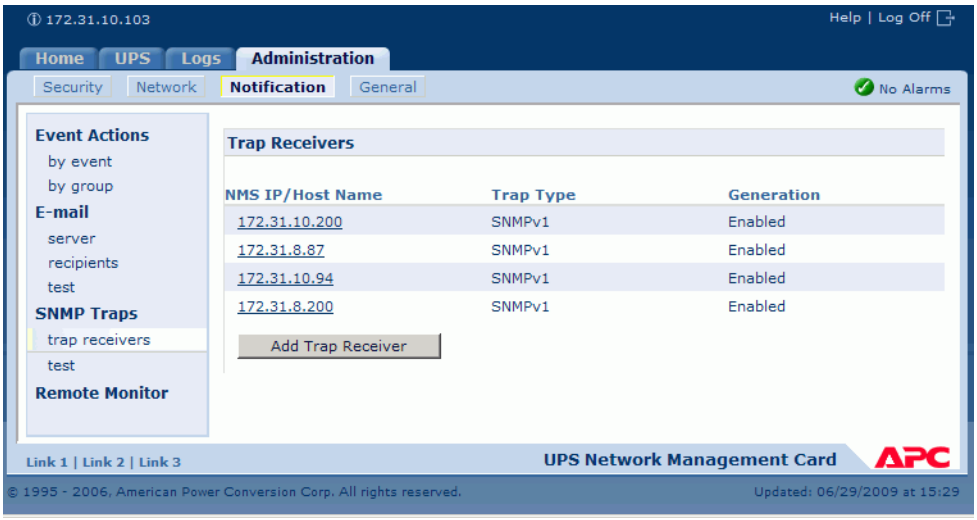


Figure 325. APC Trap Receivers

12 Click **Add Trap Receiver**. The Trap Receiver window appears.

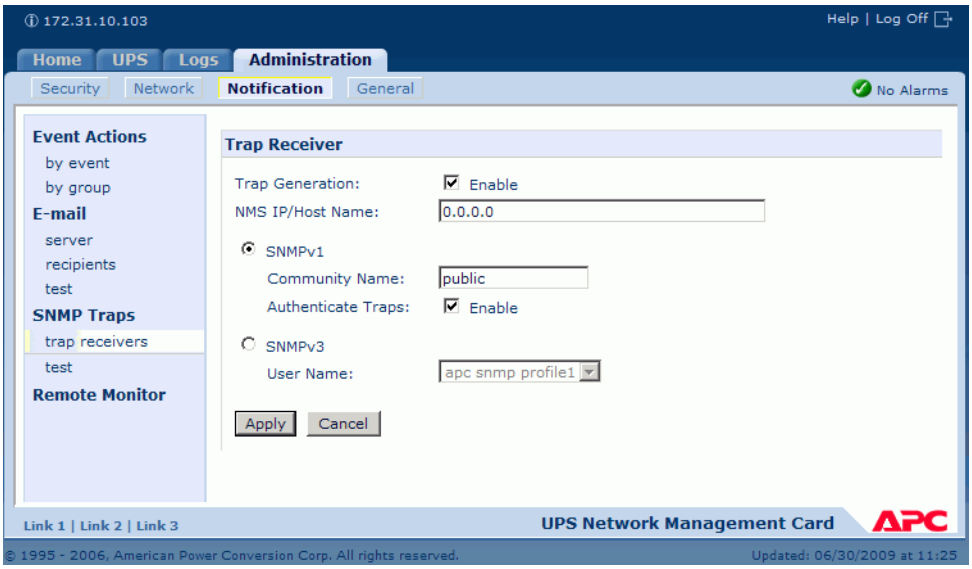


Figure 326. APC Add Trap

13 Enable trap generation for this trap receiver.

14 In the NMS IP/Host name field, enter the following:

- For a single-controller Storage Center system, enter the controller IP address .
- For a dual-controller Storage Center system, enter the IP address of the Management controller.

The default, 0.0.0.0, leaves the trap receiver undefined.

15 In the SNMPv1 field, enter **Public** (the default).

16 When **Authenticate Traps** is enabled, Storage Center receives authentication traps (traps generated by invalid attempts to log on to this device). To disable that ability, unmark the check box.

17 Click **Apply**.

To modify or delete a trap receiver, first click its IP address or host name to access its settings. (If you delete a trap receiver, all notification settings configured under Event Actions for the deleted trap receiver are set to their default values.)

Configuring a Liebert™ UPS

To configure Liebert UPS

1 In a new browser window, enter the **IP address**, assigned or derived from DHCP. The Monitor window appears.

2 Click the **Configure** tab. The Configuration Categories window appears.

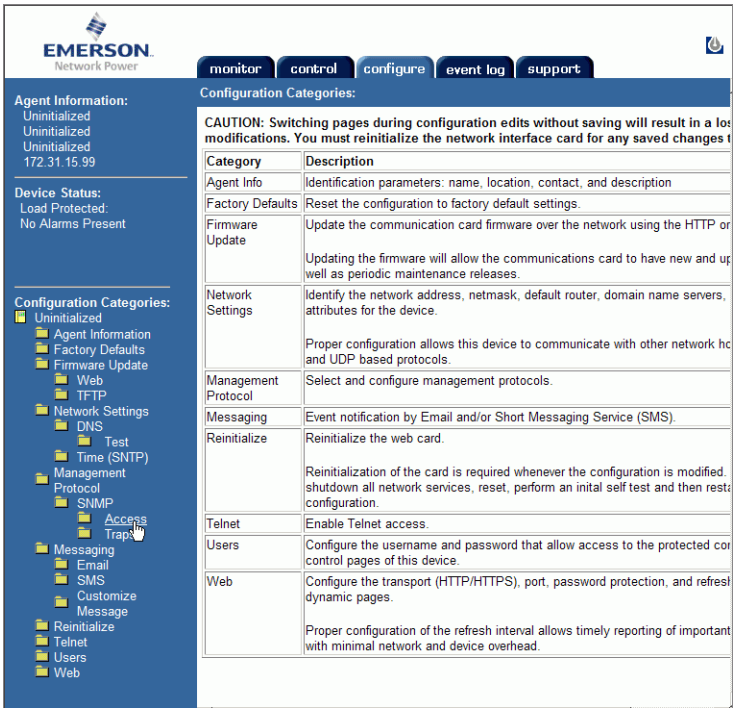


Figure 327. Liebert Configuration Window

3 From the tree on the left side, select **Management Protocol > SNMP > Access**.

4 The system may ask for a user name and password. Enter your user name and password.

The Access window appears.

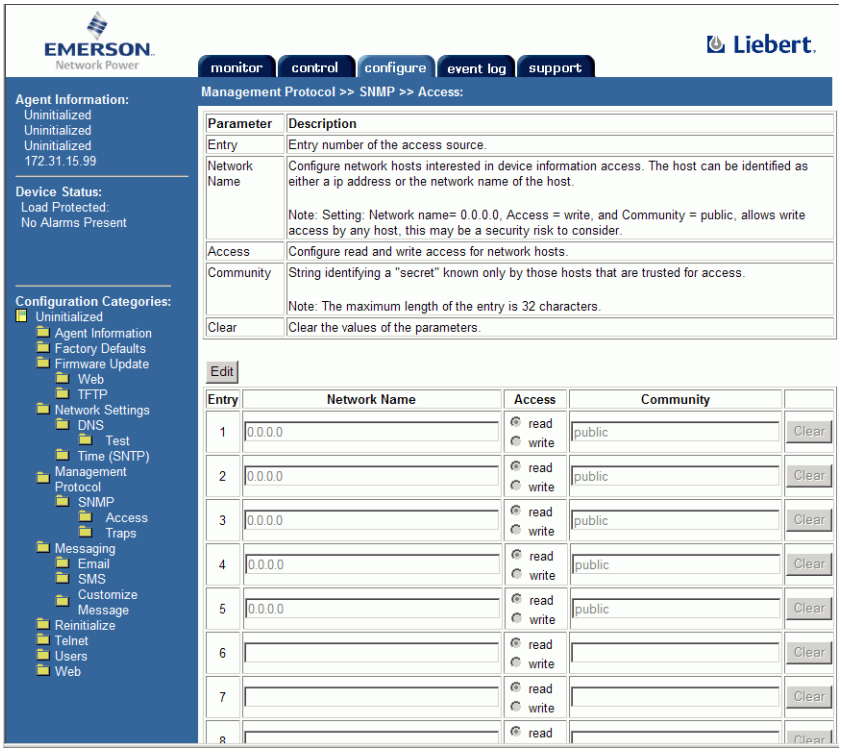


Figure 328. Enter Liebert SNMP

5 Click **Edit**.

6 In the **Network Name** column, enter the following:

- For a single-controller Storage Center system, enter the controller IP address on the first unused line.
- For a dual-controller Storage Center system, enter the IP address of each controller on the first two unused lines. (Do not enter the Management IP of the Storage Center but the true ETH0 IP of each Controller. For IP addresses, refer to Viewing Controller Properties on page 144.)

7 Select **Read** Access.

8 In the Community name enter **Public**.

9 Click Save.

10 From the tree on the left side, select **Management Protocol > SNMP > Traps**.

The Traps window appears.

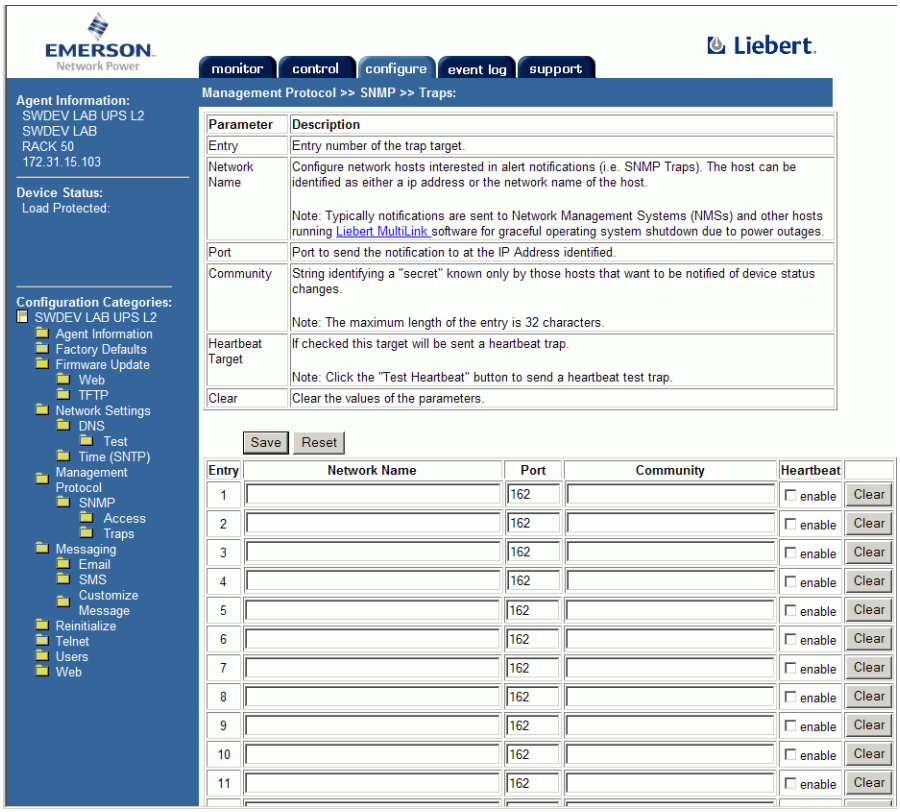


Figure 329. Traps Section

11 Click **Edit**.

12 In the Network Name column, enter the following:

- For a single-controller Storage Center system, enter the controller IP address on the first unused line.
- For a dual-controller Storage Center system, enter Management IP address (not the ETH0 address). To view Storage Center IP addresses, refer to Viewing Controller Properties on page 144.)

13 In the Community column, enter **Public**.

14 Select or clear Heartbeat.

15 Click **Save**.

To reinitialize

1 In the menu tree on the left side, click **Reinitialize**.The Reinitialize window appears.

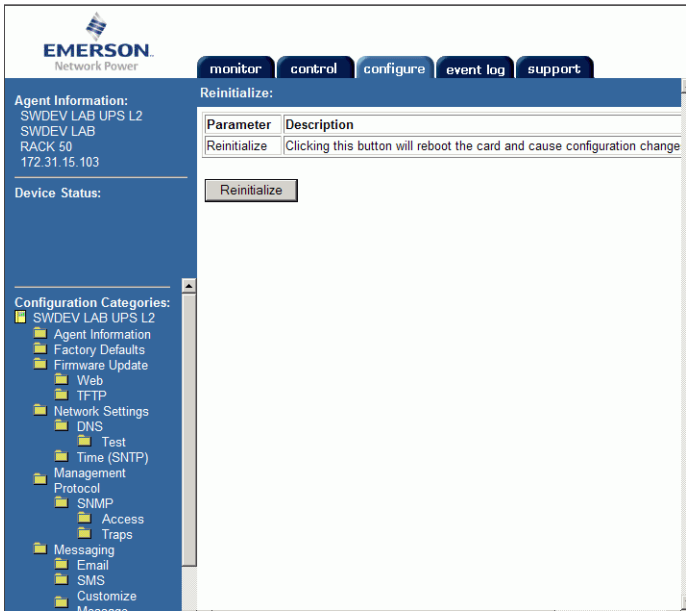


Figure 330. Reinitialize Window

2 To save changes, click **Reinitialize**.The UPS is added to the Storage Center configuration.

E Server HBA Settings

Introduction 416
Settings by HBA Vendor 416
Settings by Server Operating System 419

Introduction

This document details the recommended settings for server HBAs and Operating Systems while connected to a Storage Center.

Settings by HBA Vendor

Emulex Card Settings

NodeTimeOut	60
QueueDepth	254
Topology	1

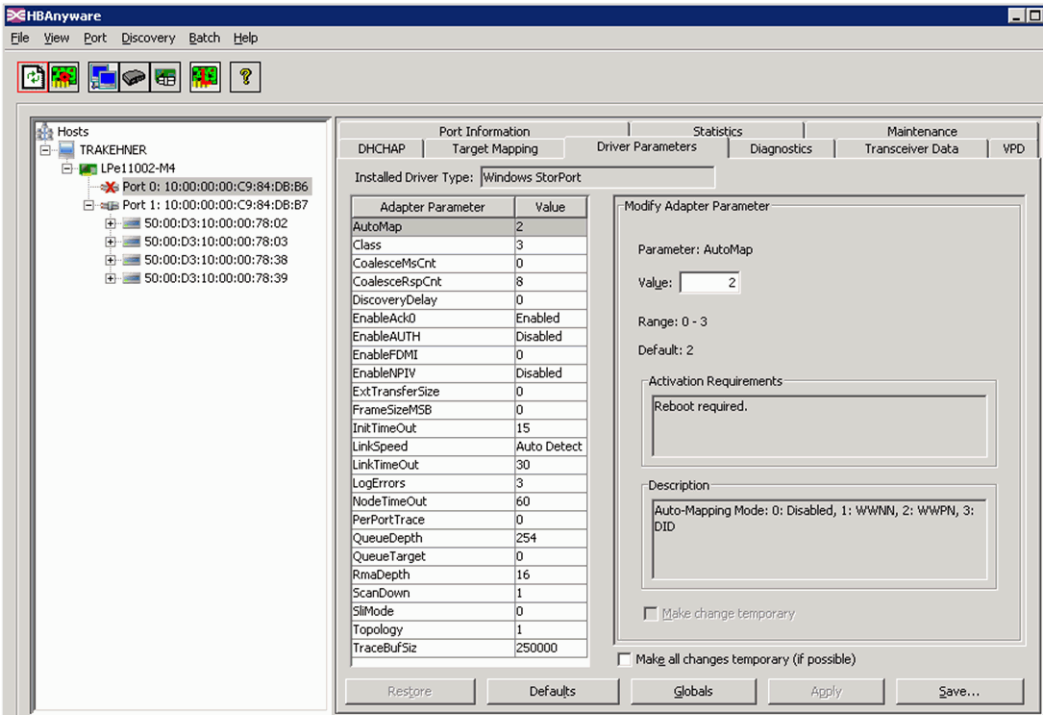


Figure 331. Emulex Card Setting

To view the Registry Editor parameters for Elxstor Port Settings shown in Figure 332, go to:

Computer\HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\elxstor\Parameters*[WWPN of port on card].*

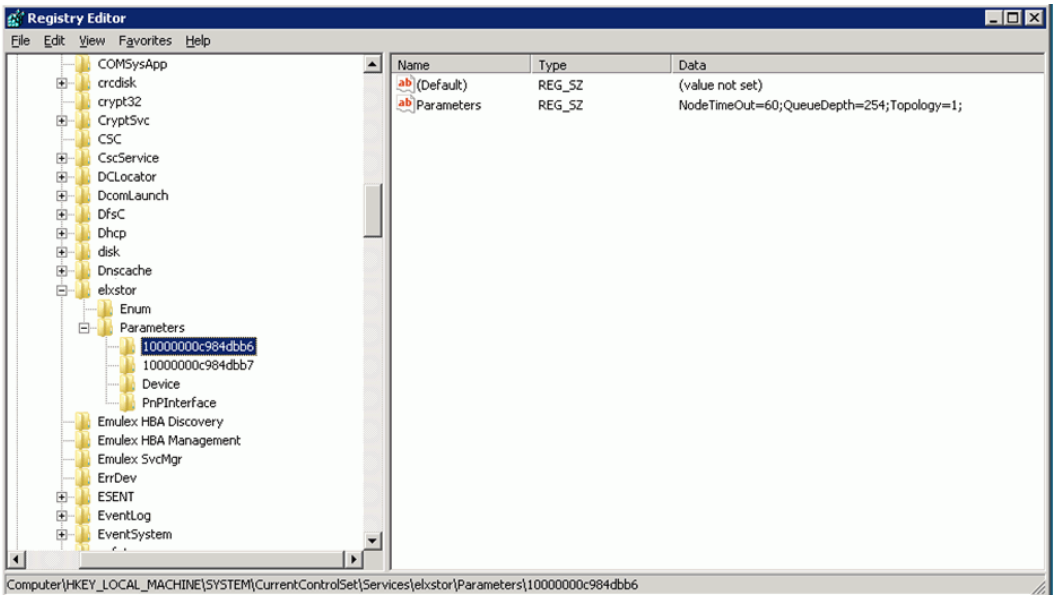


Figure 332. Elxstor Port Settings

To view the Registry Editor parameters for Elxstor Device Settings shown in Figure 333, go to:

Computer\HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\elxstor\Parameters\Device

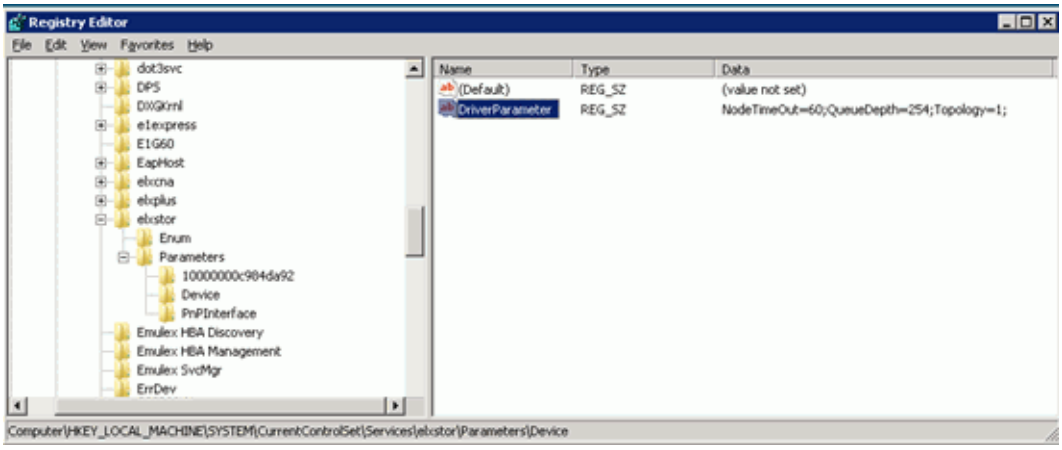


Figure 333. Elxstor Device Settings

Qlogic Card Settings

Connection options	1 for point to point only
Login retry count	60 attempts
Port down retry count	60 attempts
Link down timeout	30 seconds
Queue depth	255

For Windows Qlogic 23XX or 24XX (FC) registry settings, refer to Qlogic 23xx or 24xx (FC) Registry Key Settings on page 423.

For Windows Qlogic 40XX (iSCSI) settings, refer to Qlogic 40XX (iSCSI) Settings on page 423.

Cambex Card Settings

Topology list	P2P_ONLY for point to point only
Logout delay	60 seconds

Settings by Server Operating System

AIX Settings

Hdisk Attributes

queue_depth hdisk attribute	32
rw_timeout hdisk	60

Solaris Settings

Note Changes to Solaris settings require a reboot.

/kernel/drv/fcp.conf Settings

To the bottom of this file, add:

```
fcp_offline_delay=60
```

/kernel/drv/qlc.conf Settings

Change the following variables to their associated values.

login-retry-count	60
port-down-retry-count	60
link-down-timeout	30

/kernel/drv/qla2300.conf Settings

Change the following variables to their associated values.

login-retry-count	60
port-down-retry-count	60
link-down-timeout	30

HP-UX Settings

No additional changes

SLES Settings

Non-Boot Environment

1 To the end of the /etc/modprobe.d/qla2xxx file, add:

```
options qla2xxx qlport_down_retry=65
```

2 Reload the driver.

Example:

```
# echo "options qla2xxx qlport_down_retry=65" >> /etc/modprobe.d/qla2xxx
# modprobe -r qla2xxx
# modprobe qla2xxx
```

Boot Environment

1 To the end of the kernel line in /boot/grub/menu.lst, add:

```
qla2xxx.qlport_down_retry=65
```

2 Reboot.

Example:

```
# vi /boot/grub/menu.lst
# reboot
```

RHEL Settings

Non-Boot Environment

1 To the end of the /etc/modprobe.conf file, add:

```
ooptions qla2xxx qlport_down_retry=65
```

2 Reload the driver.

Example:

```
# echo "options qla2xxx qlport_down_retry=65" >> /etc/modprobe.conf
# modprobe -r qla2xxx
# modprobe qla2xxx
```

Boot Environment

1 To the end of the /etc/modprobe.conf file, add:

```
options qla2xxx qlport_down_retry=60
```

2 Update the init ram disk.

3 Reboot.

Example:

```
# echo "options qla2xxx qlport_down_retry=60" >> /etc/modprobe.conf
# mkinitrd -f -v /boot/initrd-<kernel version>.img <kernel version>
# reboot
```

Netware Settings

Startup.ncf Settings

In the file c:/nwserver/startup.ncf, to the end of the FC driver load line, add:

```
/LUNS /ALLPATHS /ALLPORTS /PORTDOWN=60
```

Windows Settings

Refer to Microsoft documentation for complete details on changing registry values for the iSCSI initiator:

http://blogs.msdn.com/b/san/archive/2008/07/27/microsoft-iscsi-software-initiator-isns-server-timers-quick-reference.aspx for details.

Time Out

In regedit, make the following change:

H_Key_Local_Machine

->System

->CurrentControlSet

->Services

->disk -> Timeout Value=60

MaxRequestHoldTime and LinkDownTime Settings

MPIO not enabled

When using a Microsoft 2008 R2 iSCSI initiator with a 10G iSCSI card, you should set the MaxRequestHoldTime to 120 to prevent loss of host connectivity during controller failover.

In regedit, make the following change:

H_Key_Local_Machine

->System

->CurrentControlSet

->Control

->Class

->{4D36E97B-E325-11CE-BFC1-08002BE10318}

-><*Instance Number*>
(which is the storage controller instance of the MS iSCSI Initiator)

->Parameters->MaxRequestHoldTime=120

MPIO enabled

When using a Microsoft 2008 R2 iSCSI initiator with MPIO enabled, LinkDownTime should be set to 120 to prevent loss of host connectivity during controller failover.

In regedit, make the following change:

H_Key_Local_Machine

->System

->CurrentControlSet

->Control

->Class

->{4D36E97B-E325-11CE-BFC1-08002BE10318}

-><*Instance Number*>
(which is the storage controller instance of the MS iSCSI Initiator)

->Parameters->LinkDownTime=120

Qlogic 23xx or 24xx (FC) Registry Key Settings

1 Set the following Windows registry key to 255:

HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\ql2300\Parameters\Device\MaximumSGList

2 Set the following Windows registry key to 254:

HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\ql2300\Parameters\Device\NumberOfRequests

3 For STORport drivers, set the following Window registry to qd=254

HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\ql2300\Parameters\Device\DriverParameter

4 Reboot the server.

Qlogic 40XX (iSCSI) Settings

Set Execution Throttle

Use Qlogic SANsurfer for iSCSI to set the execution throttle for the installed ports to 250. Be aware that the card must be reset, which can be performed without rebooting the server through the SANsurfer interface.

Enable Address Resolution Protocol (ARP) Redirection on iSCSI HBA

1 From the QLogic SANsurfer iSCSI HBA Manager, select the **Port Options** tab and then select the **Firmware** tab.

2 Select an HBA and enable ARP redirect by checking the box in the **ARP Redirect** column. This setting is circled in red below.

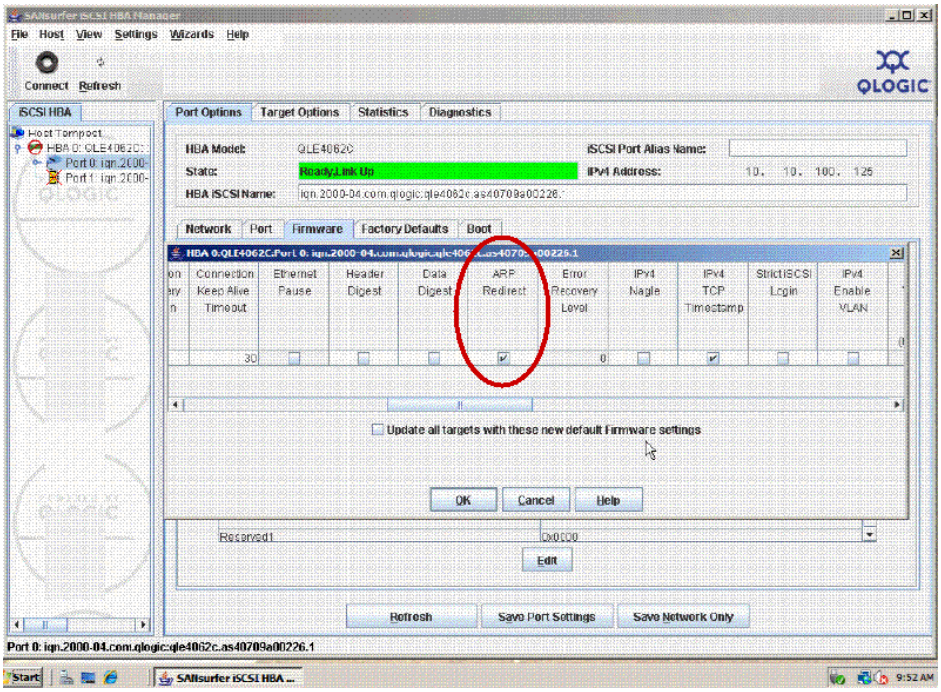


Figure 334. Sansurfer Enable ARP Redirect

3 Select **OK** and then **Close**.

4 To save settings, select the **Save Port Settings** option. If prompted for a password, enter **config**. After the password is accepted, the card will reset and the new configuration will be activated and saved.

VMWare Settings

No additional changes

Tru64 Settings

No additional changes

OpenVMS Settings

No additional changes

Glossary

A

Assigned Disks

Same as Managed Disks. Physical disks that are identified by Storage Center and to which data can be written. Assigned disks use metadata to track information about volumes on the disk and other assigned disks managed by the controller.

Asynchronous Replication

After data has been written to the primary storage site, new writes to that site can be accepted without having to wait for the secondary (remote) storage site to also finish its writes. Asynchronous Replication does not have the latency impact that synchronous replication does, but if the primary site failed before the data was written to the secondary site the data that had not yet been written could be lost. See also replication.

B

Back End

The component in the Storage Center SAN flow of data writes (server to switch to controller to disks) that receive data writes. In general, disk drives in enclosures are the back end of the controller. However, a remote system that is receiving replication data from a local Storage Center is the back end local Storage Center. See Target System.

Backup

A two step process. A Replay is first copied to a non-volatile disk remote system. In the event of problems (such as disk drive failures, power outages, or virus infection) resulting in data loss or damage to the original data, the Replay is retrieved and restored to a View Volume.

Bandwidth

The amount of data that can be sent to or from Storage Center per internal time.

Block Data

Raw data which does not have a file structure imposed on it. Database applications such as a SQL Server or an Exchange Server transfer data in blocks. Block transfer is the most efficient way to write to disk.

C

CHA

Compellent Host Adapter.

CHAP

Challenge Handshake Authentication Protocol (CHAP) is an option for authentication of iSCSI communications. CHAP periodically verifies the identity of a peer using a 3-way handshake, initially when the link is established. After the Link Establishment phase is complete, the authenticator sends a challenge message to the peer. The peer responds with a value calculated using a one-way hash function. The authenticator checks the response against its own calculation of the expected hash value. If the values match, the authentication is acknowledged; if values do not match, the connection is terminated. CHAP provides protection against playback attack through the use of an incrementally changing identifier and a variable challenge value. The use of repeated challenges is intended to limit the time of exposure to any single attack.

This authentication method depends upon a secret known only to the authenticator and peer. The secret is not sent over the link and is available in plaintext form.

The challenge value satisfies two criteria: uniqueness and unpredictability. Each challenge value must be unique, since repetition of a challenge value in conjunction with the same secret would permit an attacker to reply with a previously intercepted response. Since it is expected that the same secret might be used to authenticate with servers in disparate geographic regions, the challenge must exhibit global and temporal uniqueness. Each challenge value should also be unpredictable, lest an attacker trick a peer into responding to a predicted future challenge, and then use the response to masquerade as that peer to an authenticator. Although protocols such as CHAP are incapable of protecting against real-time active wiretapping attacks, generation of unique unpredictable challenges can protect against a wide range of active attacks.

Cache

A high speed memory or storage device used to reduce the effective time required to read data from or write data to a lower speed memory or device. Storage Center provides configurable cache to minimize disk latencies.

Cluster Node

Server that is a member of a server cluster.

Clustered Controllers

More than one Storage Center controller that is interconnected (typically at high-speeds) for the purpose of improving reliability, availability, serviceability and performance (via load balancing). Storage Center provides automatic controller failover in an active-active configuration. Fully mirrored, battery backup cache provides automatic restart and volumes migrate between controllers in the event of controller failure.

Conservation Mode

Refer to Conservation Mode on page 246.

Control Port

In Virtual Port Mode, a Control Port is created for each iSCSI Fault Domain. iSCSI Servers connect to the Storage Center via the Control Port. The Control Port redirects a connection to the appropriate Virtual Port.

Controller

Provides disk aggregation (RAID), I/O routing, error detection, and data recovery. Provides the intelligence for the entire Storage Center subsystem. Every Storage Center system contains at least one.

torage Center and recommend corrective actions to improve performance and availability of the system.

Copy-Mirror-Migrate

Storage Center feature allowing volumes to be migrated between different disk types and RAID levels.

D

DNS (Domain Name Service)

Name of the TCP/IP stack that converts domain names into IP addresses.

Data Instant Replay

Ensures high system and application availability. Enables backup and recovery of volumes without impacting system resources. Captures a point in time copy, based on the Replay Profile. This provides the ability to roll back a volume to a previous point in time. Only data that has changed from the previous point in time copy is stored.

Data Progression

Automatically migrates data to the right class of storage based on assigned or recommended policies. Allows businesses to optimize utilization of storage resources through migration to the appropriate class of storage devices, to higher or to lower performance devices, based on data access requirements.

Deduplication

Deduplication copies only the changed portions of a Replay, rather than all data captured in each Replay.

Dell Support Services

Combination of centralized support, product education and sales resources that proactively monitor S

Disaster Recovery

The ability to recover from the loss of a complete site, whether due to natural disaster or malicious intent. Storage Center disaster recovery include Data Instant Replay and Remote Instant Replay.

Disk Enclosure (see Enclosure)

Disk Folders

A collection of physical disks that can be assigned attributes by the user. Performance is improved by maximizing the number of disk drives in a folder. Volumes draw storage from disk folders. Folders may be associated with multiple pagepools.

Disk Position

The position of the disk in the enclosure. An example of a disk position is 01-01. The first number is the row number, from the top of the enclosure. The second number is column number from the left of the enclosure. For example, Disk 01-02 is in the first (top row) and second column from the left.

Dual Redundancy

See Redundancy

Dynamic Controllers

A minimum of two Storage Center clustered controllers that provide automatic failover via an internal heartbeat

E

Emergency Mode

Refer to Emergency Mode on page 246.

Enclosure

The box that holds the disks. Provides disk status, temperature sensors, cooling fans, an alarm system, and a single interface to the controller.

Ethernet

A protocol that defines a common set of rules and signals for networks.

Eth0

Ethernet port 0. Storage Center uses Eth0 to support system login and access for the GUI, Replication, and to send email, alerts, SNMP traps, and Phone Home data.

Eth1

Storage Center uses Eth1 for dedicated InterProcess Communication between controllers in a multi-controller system.

F

FTP

File Transfer Protocol. Program used to transfer files from another computer.

Fabric

A combination of interconnected switches that act as a unified routing infrastructure. It allows multiple connections among devices on a SAN and lets new devices enter unobtrusively. A FC (or iSCSI) topology with at least one switch present on the network.

FastTrack

An optional Storage Center utility that dynamically places the most active data on the outer (faster) disk tracks.

Fault Domain

A Fault Domain identifies a failover set. In Virtual Port mode, all front-end ports can be part of the one fault domain. In Legacy Mode, each primary and reserved port creates one fault domain.

Fibre Channel

A high-speed interconnect used to connect servers to Storage Center controllers and back-end disk enclosures. FC components include HBAs, hubs, switches, and cabling. The term FC also refers to a high-speed, fully duplexed serial communication protocol permitting data transfer rates of up to 10 Gigabit per second.

Front End

The component in the Storage Center SAN flow of data writes (server to switch to controller to disks) that initiates data writes. In general, servers (or switches) are the front end of the controller. However, a Storage Center system that is replicating data to a remote system is the front end of the remote system. See Back End.

G

GUI

Graphical User Interface

H

HBA

By convention, Storage Center refers to the ports on cards in server as HBAs.

HBA Type

In the Storage Center, there are two HBA types: FC and iSCSI.

High Availability

A continuously available system is characterized as having essentially no downtime in any given year. A system with 99.999% availability experiences only about five minutes of downtime. In contrast, a high availability system is defined as having 99.9% uptime, which translates into a few hours of planned or unplanned downtime per year.

HBA (Host Bus Adapter)

The HBA is the intelligent hardware residing on the host server that controls the transfer of data between the host and the Storage Center.

HNR

Host Name Resolution

HTTP

Hyper Text Transfer Protocol

Hot Spare

A hot spare disk is a backup disk. In the event that an active array fails, the controller makes the hot spare part of the active array and rebuilds data on the fly. Although the hot spare becomes an active disk without human intervention, remember to replace the failed drive as soon as possible, so that the array is again protected with a new hot spare. Hot spares can span multiple disk enclosures. A Storage Center hot spares can have a different capacity than the data drive it replaces.

Host Bus Adapter

See HBA

I

Initiator

A source Storage Center system that initiates replication. Data is copied from an initiator to a Target System.

Instant Replay

See **Data Instant Replay**.

IO

Input/output. The process of moving data between a computer system's main memory and an external device or interface such as a storage device, display, printer, or network connected to other computer systems. IO is a collective term for reading, or moving data into a computer system's memory, and writing, or moving data from a computer system's memory to another location.

iSCSI

iSCSI (Internet SCSI) is the specification that defines the encapsulation of SCSI packets over ethernet using the TCP/IP transport protocol, or a protocol that enables transport of block data over IP networks, without the need for a specialized network infrastructure, such as FC.

J

JBOD

Just a bunch of disks. An enclosure that contains storage disks, fans, and an HBA port with which it connects to a controller.

L

LAN

Local Area Network

Leader Controller

In a dual controller system, the leader controller is the primary controller. Under ordinary circumstances, the controllers share read/write duties, thus doubling IOs. In the event the peer controller fails, the lead controller assumes the duties of both controllers. See **Peer Controller**.

Legacy Mode

Non-virtual port mode. in legacy mode, Fault Domains associate Primary and Reserved Front End ports to each other as opposed to Virtual Mode where all front end ports can be part of the same fault domain.

Load Balancing

Referring to the ability to redistribute load (read/write requests) to an alternate path between server and storage device, load balancing maintain high performance IO.

LUN

A logical unit is a conceptual division (a subunit) of a storage disk or a set of disks. Each logical unit has an address, known as the logical unit number (LUN), which allows it to be uniquely identified.

M

MAC Address

In computer networking a Media Access Control address (MAC address) is a quasi-unique identifier attached to most network adapters (NICs). It is a number that acts like a name for a particular network adapter, so, for example, the network cards (or built-in network adapters) in two different computers will have different names, or MAC addresses. It is possible to change the MAC address.

Management IP Address

Address used to used to connect to Storage Center. Each controller has its own IP address, but the management IP address remains constant. If, In a dynamic controller system, a controller fails or is replaced, Storage Center the system connection remains.

Managed Disks

Disks that are grouped together to form a discrete bundle, across which data is striped and from which volumes are created.

Manual Replay

Storage Center feature that allows the user to manually create point in time copies of volumes.

Mapping (Volume to Server)

Mapping defines which servers can access specific volumes. Once this linkage is established, the volume will appear to the server as a single, local disk drive of the specified size.

Mentoring Controller

During installation or after replacing or adding a controller, the mentoring controller copies system configuration to the new or added controller. Either the lead or peer controller can become a mentoring controller.

MIB

Management Information Base. A database of objects that can be accessed by SNMP.

Multipathing

Redundant storage components that transfer data between server and storage. These components include cabling, adapters, switches, and the software that enables multipathing.

N

NAS

Network Attached Storage

NAT

Network Address Translation (NAT) also known as network masquerading or IP-masquerading rewrites the source or destination addresses of IP packets as they pass through a router or firewall. Most systems using NAT do so in order to enable multiple hosts on a private network to access the Internet using a single public IP address. According to specifications, routers should not act in this way, but many network administrators find NAT a convenient technique and use it widely. Nonetheless, NAT can introduce complications in communication between hosts.

NDMP

Network Data Management Protocol is an open standard for backing up data in a heterogeneous environment

NFS

Network File System

NIC

Network Interface Card

NPIV Mode

N_Port ID Virtualization is a prerequisite for enabling FC virtual ports. If a switch does not accept NPIV, FC ports cannot be converted to Virtual Ports and NPIV is turned off.

NTP

The Network Time Protocol (NTP) is a protocol for synchronizing the clocks of computer systems over packet-switched, variable-latency data networks.

NTS

Network Time Protocol (NTP) is a protocol for synchronizing the clocks of computer systems over packet-switched, variable-latency data networks.

P

Pagepool

A pool of storage

Pagepool Alert

The first alert generated when the pagepool space consumed by volumes and Replays exceeds the configurable pagepool alert threshold, and there is no more free disk space available for the pagepool to consume.

Peer Controller

The peer controller is the equal of the Lead controller. In a dual controller system, both controllers share read/write duties, thus doubling IOs. But in the event the lead controller fails, the peer controller assumes the duties of both controllers.

Port

The physical connection point on servers, switches, Storage Center controller, and disk drive enclosures that is used to connect to other devices in the system. Ports on a FC network are identified by their Worldwide Port Name (WWPN); on iSCSI networks, ports are given an iSCSI name.

Preallocation

Pre-allocating storage physically assigns storage to the volume before its use by the server. Not allowed for volumes already having Replays.

Q

QoS Definition

Quality of Service. A networking term that specifies a guaranteed throughput level to guarantee end-to end latency will not exceed a specified level.

R

RAID (Redundant Array of Independent Disks)

A way of encoding data over multiple physical disks to ensure that if a hard disk fails a redundant copy of the data can be accessed instead. Example schemes include mirroring and RAID-5.

RAID 0

Stripes data but provides no redundancy. If one disk fails, all data is lost. Do not use RAID 0 unless data is back-up elsewhere.

RAID 5-5 and 5-9

Maintains a logical copy of the data using a mathematically derived rotating parity stripe across 5 or 9 disks. The parity stripe is derived from the data stripes. This method has less overhead for the redundant information than RAID 10; however write performance is slower than RAID 10 due to the calculation of the parity stripe for every write.RAID 5 protects against data loss when any single disk fails. RAID 5-5 is 80% efficient. RAID 5-9 is 89% efficient.

RAID 6-6 and 6-10

RAID 6 protects against data loss when any 2 disks fail. RAID 6-6 is 67% efficient. RAID 6-10 is 80% efficient.

RAID 10

Striped and mirrored. Provides both data availability and top performance. Maintains a minimum of one full copy of all data on the volume. RAID 10 provides optimum Read / Write performance, increased probability of withstanding multiple failures, and the fastest restoration of data.

RAID 10-DM

RAID 10 Dual Mirror provides maximum protection for storage. Data is written simultaneously to three separate disks. All three disks return a write acknowledgement. RAID 10 protects against data loss when any 2 disks fail.

Redundancy

The duplication of information or hardware equipment components to ensure that if a primary resource fails, a secondary resource can take over its function. Storage Center provides redundancy for each component so that there is no single point of failure. Single Redundancy protects against loss of data if any one disk fails. Dual Redundancy protects against data lost if any two disks fail.

Remote System

A Storage Center system that sends or receives Replication data.

Remote Instant Replay

Remote Instant Replay is a Replay written to a remote backup site. The sites can be active-active, with bi-directional remote copies that can either have matched or split intervals. Also knows as Replication.

Remote System

A Storage Center system that is receiving Replication data.

Replay

A fully usable copy of a defined collection of data that contains an image of the data as it appeared at the point in time at which the copy was initiated. For more information, refer to **Data Instant Replay**.

Replay Profile

Set of rules for taking Replays that is applied to all volumes using that profile.

Replication

Replication is the process of duplicating data from one highly available site to another. The replication process can be synchronous or asynchronous; duplicates are known as Replays.See **Remote Instant Replay**.

S

SAN

A storage area network (SAN) is a specialized network that provides access to high performance and highly available storage subsystems using block storage protocols. The SAN is made up of specific devices, such as host bus adapters (HBAs) in the host servers, switches that help route storage traffic, and disk storage subsystems. The main characteristic of a SAN is that the storage subsystems are generally available to multiple hosts at the same time, which makes them scalable and flexible. Compare with NAS.

SAS

Serial Attached Storage. For more information about SAS, refer to the *Storage Center System Connectivity Guide*.

SBOD

Switched Bunch of Disks.

SCSI

SCSI (Small Computer Systems Interface) is a collection of ANSI standards that define IO buses primarily intended for connecting storage devices to servers.

Server

Servers define connectivity to the Storage Center. They allow you to associate your server name to the hardware connectivity presented by the server for easy identification.

Single Redundancy

See Redundancy

SMB

Server Message Block

SMTP

Simple Mail Transfer Protocol (SMTP) defines a message format and forwarding procedure to enable messages to be sent between hosts on the Internet.

Snapshot

See Replay.

SNMP

Simple Network Management Protocol (SNMP) is an Internet-standard Layer-7 (application layer) protocol for collecting information from and configuring network devices such as servers, hubs, switches, and routers on an Internet Protocol (IP) network. SNMP can be used to collect information about network statistics from these devices and to relay this information to a central management console to monitor network health, trap errors, perform diagnostics, and generate reports.

SOIP

Storage Over Internet Protocol, San Jose-based Nishan Systems term for linking SCSI and FC storage interfaces with IP and Ethernet network interfaces

SSL

Secure Sockets Layer

Standard Datapage Size

For Storage Center, a standard datapage size is 2 MB.

Storage Area Network

See SAN

Storage Center™

A complete storage solution that provides unified physical storage and storage management.

Storage Center Architecture integrates multiple disk technologies with multiple interfaces and controllers.

Storage Clustering

Storage Center software providing automatic controller failover through multiple controllers in an active-active configuration. Fully mirrored, battery backup cache provides automatic restart in the event of a controller failure.

Storage Interface (back end)

Refers to the storage interface of the Storage Controller.

Storage Pool

An undifferentiated pool of available disk space from which Storage Center draws creates volumes.

Storage Profile

A collection of rules that identify RAID level and drive types (tiers) on which data is stored. All volumes are attached to a Storage Profile. Storage Profiles can be applied by default, per volume, to a group or all volumes. If RAID levels or tiers in a Storage Profile change, data in volumes attached to that Storage Profile is moved via Data Progression to the new RAID levels or tiers.

Storage Type

Pool of storage from which volumes are created. Storage Center is most efficient when all disks are combined into one pool of storage. Data Progression can then store data with maximum efficiency. In some circumstances, you can create additional based on redundancy and data page size.

Synchronous Replication

In synchronous replication, each write to the primary disk and the secondary (remote) disk must be complete before the next write can begin. The advantage of this approach is that the two sets of data are always synchronized. The disadvantage is that if the distance between the two storage disks is substantial, the replication process can take a long time and slows down the application writing the data. See also asynchronous replication.

T

Target System

The Storage Center system that receives replication data from an initiating Storage Center. See Initiator.

TCP/IP

Terminal Control Protocol/Internet Protocol

Tiers

Blocks of data that are stored according to its intended use. For example, data that has been accessed within the last four progression cycles is stored on the highest tier, composed of the fastest disks. Data that has not been accessed for the last 12 progression cycles is gradually migrated down to the lowest tier, composed of slower, cheaper, larger disks.

Thin Provisioning

Volume sizes can be defined that are greater than the actual physical storage. Storage space is only used when data is written. Thin Provisioning allows organizations to reduce their overall disk expenditures, increase availability and achieve greater performance.

Transport Type

The protocol used to communicate data between the Storage Center and attached servers.

Tunneling (Storage tunneling)

FC SAN frames are encapsulated in IP packets for transport to another FC SAN

U

Unassigned Disk

Disk drives that have not been assigned to a managed disk folder and therefore cannot be used by the system.

Unmanaged Disk

Same as unassigned disk.

UPS

Uninterruptible Power Supply. A power supply that includes a battery that will keep Storage Center running in the event of a power outage. Power from the battery will last long enough to save data in RAM and shut Storage Center down gracefully.

V

View Volume

A volume that has been recreated from a previous Replay. Refer to Creating a View Volume on page 321.

Virtual Port

Virtual Ports eliminate the need for reserve ports. When operating in Virtual Port mode, all front-end ports accept IO and can be part of one Fault Domain. For information on enabling Virtual Ports, refer to the *Storage Center 5 Setup Guide.*

Virtualization

The amalgamation of multiple network storage devices into what appears to be a single storage unit. Virtualization makes tasks such as archiving, back-up, and recovery easier and faster. Virtualization is implemented through the Storage Center controller software. Also, the ability to span volumes across any number of physical disks. A logical representation of physical storage assets.

Volume

A volume is a discrete area of storage striped to multiple hard disks.

Volume Type

Volume Type: can be dynamic, Replay enabled, or Replication. A volume is dynamic until at least one Replay has been taken of that volume. Once a Replay has been taken of a volume, it becomes Replay Enabled. A Replication volume is one that is being Replicated to another Storage Center system.

W

WINS

Windows server that translates a NetBIOS name to an IP address.

WWN

World Wide Name

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